2.6.3 MATERIALS REMOVAL AND PERIODIC MAINTENANCE

Approximately 160,000 cy of material is proposed to be exported to LA-5 for the implementation of Alternative 1A, with the majority in the west and central basins (Table 2-14). This would primarily be material from existing channels as they are deepened and widened to improve tidal movement. That material would not be suitable for reuse as beach or littoral cell nourishment because of the relatively fine grain size. Given the relatively modest amount of material and because there is no large area proposed for disturbance that could accommodate an overdredge pit in the central basin, no overexcavation would occur in this scenario. Alternative 1A would utilize some material removed from the site to fill the former sewage settling pond in the central basin (approximately 35,000 cy) and cap it with sand for use as a nesting site, but additional material would be exported for disposal. Materials testing in accordance with the ODM has not been completed. If Alternative 1A is selected for implementation, additional Tier 3 testing and approval from the Corps and EPA would be required prior to disposal. Should the materials be determined not suitable for disposal at this location, the material would be sequestered on-site in built transitional or nesting areas. Inlet maintenance would use the same approach as existing management, would require approximately 2 weeks, and would generate sand suitable for placement within the littoral zone, either on the beach or in the nearshore. The sand quantity removed would be approximately 35,000 cy per year for Alternative 1A and would be anticipated to occur in April. Activities associated with long-term maintenance and adaptive management are discussed in Section 2.11.

Table 2-14
Alternative 1A Materials Removal and Periodic Maintenance

	Alternative 1A
Initial Amount of Material Removed	160,000 cubic yards
Coastal Area	*0 cubic yards*
West Basin	*50,000 cubic yards*
Central Basin	*75,000 cubic yards*
East Basin	*35,000 cubic yards*
Estimated Post-construction Periodic Volume Dredged	35,000 cubic yards
Estimated Post-construction Periodic Maintenance Frequency	Annually

Source: Nordby and M&N 2012

2.7 NO PROJECT/NO FEDERAL ACTION ALTERNATIVE

CEQA requires analysis of a No Project alternative in which the proposed project would not occur. Evaluation required under NEPA of the No Federal Action alternative evaluates the possibility of no federal permit issuance, but allows for some components of the project outside federal jurisdiction to be implemented. Because the SELRP is water dependent and cannot be implemented outside of Corps jurisdictional waters, the NEPA scope of analysis includes the complete restoration project as proposed within this EIR/EIS. No components of the project could be implemented without approval of the Corps; therefore, the No Project/No Federal Action Alternative is evaluated as a single alternative in this document. Under this alternative, there would be no dredging or excavation to improve tidal circulation, channel clearing, or other comprehensive actions to improve tidal exchange or conveyance of freshwater in high flow conditions. The lagoon inlet would remain in its existing location. Currently, management of the lagoon involves mechanical excavation to maintain an open inlet condition, as funding allows. This is assumed to continue into the future. The present spectrum of environmental constraints would continue to limit the quality and productivity of the lagoon. Under the No Project/No Federal Action Alternative, conversion from subtidal and mudflat to a system dominated by saltmarsh and riparian habitat would continue. This conversion would continue to occur fairly rapidly.

2.7.1 HABITAT DISTRIBUTION

Historically, high water elevations resulting from frequent mouth closures and water impoundment in the lagoon have resulted in mudflat and open water/tidal channels habitats. Over the last decade, active management of an open lagoon mouth has been implemented, which has resulted in rapid habitat conversion. Specifically, the existing mudflat is converting to low-marsh habitat and portions of mid-marsh are anticipated to convert to high-marsh. The rapid conversion of mudflat was observed between 2010 and 2012, with a gain of 13 acres of low-marsh (cordgrass dominated) habitat and a direct loss of mudflat. Ultimately, the conversion of another 34 acres of mudflat is anticipated as the lagoon moves toward a state of equilibrium with current water levels and inundation frequencies. This conversion is anticipated to occur within 5–10 years if current rates continue.

The practice of active management at the lagoon mouth is expected to continue under this alternative to maintain tidal exchange with the ocean and allow fluvial flows to exit the lagoon. This exchange, although limited by the existing hydraulic constraints in the lagoon, maintains more acceptable water quality levels in the lagoon. When the inlet closes to tidal flushing, the lagoon water quality rapidly deteriorates due to the nutrient load stored in the existing sediments and the impoundment of freshwater from the watershed.

Therefore, under this alternative, open water/tidal channels would continue to decrease as would mudflats and mid-saltmarsh habitat (Table 2-15). low- and high-saltmarsh habitat would continue to increase. Currently, no tidally influenced high-saltmarsh is on the site as the existing high-saltmarsh is located upstream of the current extent of tidal influence due to historic water impoundment behind the CDFW dike. Maintaining existing tidal influence would increase tidally influenced high-marsh and preserve brackish and freshwater high-marsh.

Table 2-15
No Project/No Federal Action Alternative Habitat Distribution

Habitat Type	Habitat Distribution (acres)		Habitat Type	Habitat Distribution (acres)	
	Existing[1]	Predicted[3]		Existing[1]	Predicted[3]
Avian Islands	0	0	Open Water/Tidal Channels and Basins	40	24
Mudflat	63[2]	29	Riparian	72	71
Low-Marsh	13	51	Coastal Strand	5	5
Mid-Marsh	141	107	Upland & Others	299	299
High-Marsh	120	167	Beach	15	15
Saltpan	37	37	Berms and Roads	23	23
Freshwater/Brackish Marsh	132	131	Transitional (man-made)	0	0

[1] Existing habitat acreages are from 2012 mapping efforts and reflect habitat distributions at that time.
[2] Current functioning mudflat is an artifact of past freshwater impoundment and is converting to low- and mid-marsh because it is not at a natural elevation for self-sustainable mudflat. The decrease in mudflat reflects the remaining mudflat after predicted conversion has occurred.
[3] Under the No Project/No Federal Action Alternative, current habitat conversion would continue until equilibrium is reached. Equilibrium is expected to occur within 5–10 years if existing conversion rates continue.
Source: Nordby and M&N 2012

The No Project/No Federal Action Alternative would not maximize the opportunity to implement a comprehensive restoration project for the entire lagoon. However, any one of the management/owner entities (SELC, CDFW, and/or County) may incrementally implement restoration, enhancement, and creation projects on a smaller scale through the use of other funding sources. These smaller efforts would require a separate CEQA/NEPA and permit process. If lagoon conditions persist and no restoration is initiated, lagoon habitat would continue to convert, resulting in the loss of mudflat and the increase of low- and high-marsh in the central basin. As noted above, current functioning mudflat is an artifact of past freshwater impoundment and is not at a natural elevation for self-sustainable mudflat. The decrease in mudflat for this alternative reflects remaining mudflat in the equilibrium condition (after predicted conversion has occurred). In addition, mid-marsh habitat would convert to high-marsh habitat and there would be a loss of open water habitat throughout the lagoon compared to existing conditions. While allowing the lagoon to revert to a more frequently close mouth condition could slow or halt this conversion, water quality would then be expected to deteriorate and result in eutrophic conditions.

2.7.2 Channel and Infrastructure Improvements

Under the No Project/No Federal Action Alternative, no changes to existing channels within the lagoon would occur as part of this project (i.e., widening or deepening to improve hydraulics).

Infrastructure improvements to the NCTD railroad and I-5 could continue to move forward independently, as described in Table 2-5. Seismic improvements to Coast Highway 101 may occur in the future; however, those improvements would not be completed under a lagoon restoration program.

2.7.3 Materials Removal and Periodic Maintenance

Under the No Project/No Federal Action Alternative, no materials would be dredged from the lagoon for the purpose of restoration. However, the existing inlet would continue to be opened annually, with excavated material deposited on the beach near the mouth. Based on the continuation of current efforts, the frequency and anticipated volumes associated with inlet maintenance in the lagoon under the No Project/No Federal Action Alternative are identified in Table 2-16. No other programmatic long-term maintenance or adaptive management activities would occur.

Table 2-16
No Project/No Federal Action Alternative Materials Removal and Periodic Maintenance

	No Project/No Federal Action Alternative
Initial Amount of Material Removed	0 cubic yards
Estimated Periodic Volume Dredged	25,000 cubic yards
Estimated Periodic Maintenance Frequency	Annually

Source: Nordby and M&N 2012

2.8 COMPARISON OF ALTERNATIVE CHARACTERISTICS

It is informative to compare the various characteristics of each alternative to each other to see the relative differences. Table 2-17 provides a comparison of the habitat distribution for the proposed project and alternatives. Table 2-18 provides a comparison of the inlet and channel dimensions for the proposed project and alternatives. Table 2-19 provides a comparison of the materials removal and periodic maintenance requirements.

Table 2-17
Habitat Distribution Comparison for the Proposed Project and Alternatives

Habitat Type	Habitat Distribution (acres)[1]				
	Existing	Proposed			
		Alternative 2A	Alternative 1B	Alternative 1A	No Project/ No Federal Action
Avian Islands	0	2	2	2	0
Mudflat	63	102	71	25	29
Low-Marsh	13	23	51	44	51
Mid-Marsh	141	124	98	140	107
High-Marsh	120	107	124	145	167
Saltpan	37	17	30	35	37
Freshwater/Brackish Marsh	132	96	99	121	131
Open Water/Tidal Channels and Basins	40	74	67	34	24
Riparian	72	67	67	70	71
Coastal Strand	5	5	5	5	5
Upland & Others	299	292	295	299	299
Beach	15	14	15	15	15
Berms and Roads	23	24	24	24	23
Transitional (man-made)	0	12	12	2	0
Total[2]	**960**	**960**	**960**	**960**	**960**

[1] Existing habitat acreages are from 2012 mapping efforts and reflect habitat distributions at that time.
[2] Totals may not add due to rounding.
Source: Nordby and M&N 2013

Table 2-18
Inlet and Channel Dimensions Comparison for the Proposed Project and Alternatives

	Coast Highway 101/Inlet		NCTD Railroad Trestle		I-5 Bridge	
	Bottom Width (feet)	Invert (feet, NGVD)	Bottom Width (feet)	Invert (feet, NGVD)	Bottom Width (feet)	Invert (feet, NGVD)
Existing	105	-0.87	187	-0.87	130	0.74
Alternative 2A–Proposed Project	200	-6.5	590	-7	261	-6.5
Alternative 1B	130	-4.0	187	-5.5	261	-6.0
Alternative 1A	115	-4.0	187	-5.5	130	-6.0
No Project/ No Federal Action	105	-0.87	187	-0.87	130	0.74

NGVD = National Geodetic Vertical Datum
Source: M&N 2012

Table 2-19
Materials Removal and Periodic Maintenance Comparison for the Proposed Project and Alternatives

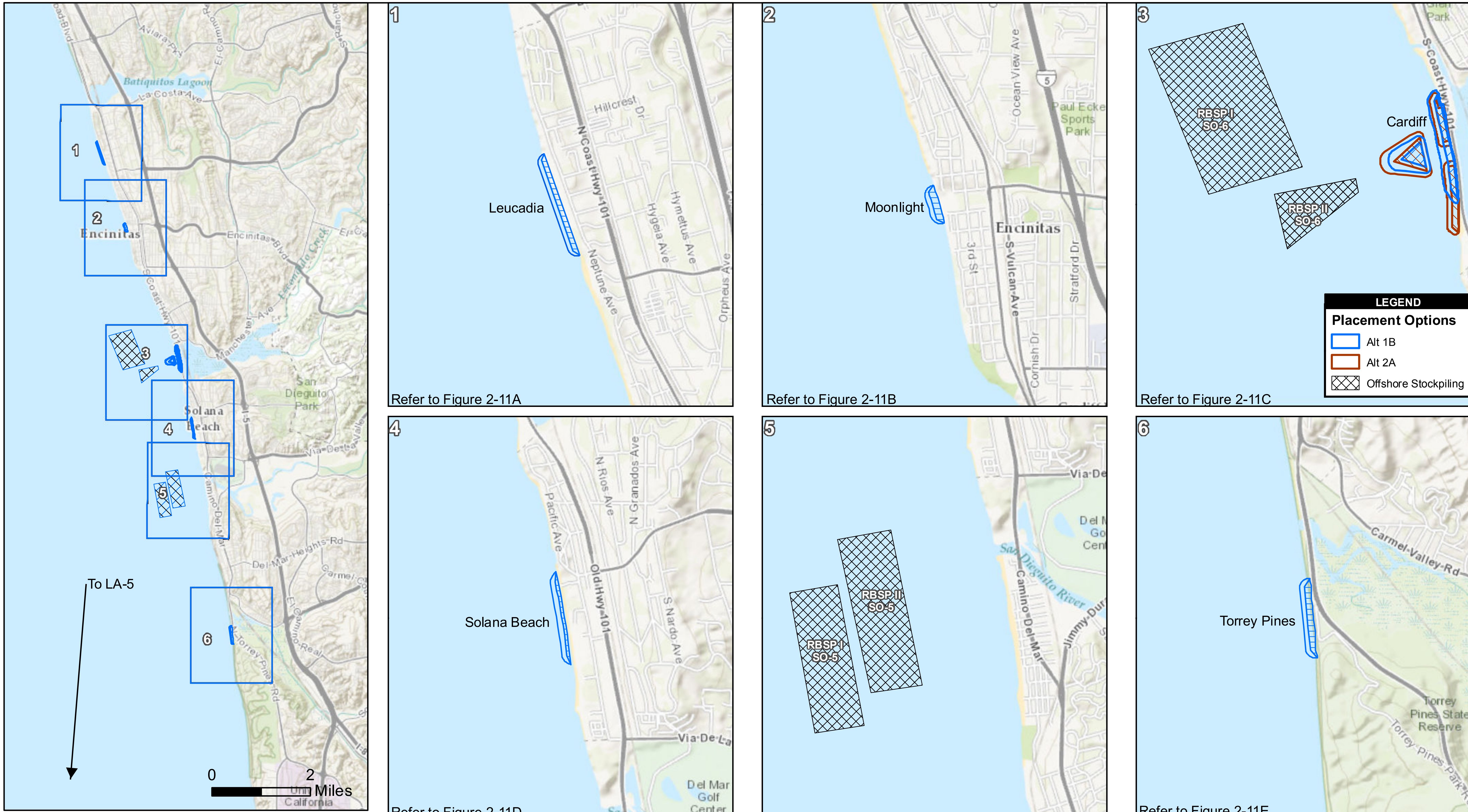
	Alternative 2A–Proposed Project	Alternative 1B	Alternative 1A	No Project/No Federal Action
Initial Amount of Material Removed	1.4 mcy	1.2 mcy	160,000 cy	0
Estimated Post-construction Periodic Volume Dredged	300,000 cy	40,000 cy	35,000 cy	25,000 cy
Estimated Post-construction Periodic Maintenance Frequency	Every 3 to 4 years	Annually	Annually	Annually

mcy = million cubic yards
cy = cubic yards

2.9 MATERIALS DISPOSAL

Depending upon the alternative, anywhere from 160,000 cy to 1.4 mcy of excavated or dredged materials would need to be disposed of and/or reused as part of restoration implementation. This is in addition to the vegetative material removed as part of clear and grub activities, which is discussed further in Section 2.10. As discussed in Section 2.2.2, specific locations have been carried forward for potential materials disposal/reuse. A matrix describing each of the materials disposal/reuse scenarios and maximum capacity per site is provided in Table 2-20 and shown in Figures 1-3 and 2-11. Alternative 2A and Alternative 1B have a variety of options. However, under Alternative 1A, material would be relatively fine-grained and is proposed to be disposed of in the offshore disposal site currently designed and permitted for such usage (LA-5).

The materials disposal/reuse scenarios described in Table 2-20 reflect a maximum volume that could be placed at a variety of locations and the total available capacity exceeds the amount of material needed to be disposed/reused for the construction of Alternative 2A or Alternative 1B. Thus, only a portion of these disposal/reuse sites, or a portion of the volume (and footprints) identified in Table 2-20, may actually be used for materials placement under those alternatives. Inlet maintenance would also result in materials to be disposed of, but material removed from the inlet is anticipated to be sandy and disposed of on the adjacent beach/nearshore, and is not taken into account in Table 2-20, which focuses on the one-time disposal needs associated with initial project implementation. To provide full public disclosure and maximum flexibility during construction, all disposal/reuse scenarios are evaluated in this EIR/EIS. Direct linkage occurs between Alternative 1A and the necessary disposal site. For the other two action alternatives, several options are available. Therefore, the materials disposal/reuse scenarios are evaluated independently throughout the document.



Source: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community; SanGIS 2012; MoffattNichol 2012

2,500 1,250 0 2,500 Feet

Scale: 1 = 30,000; 1 inch = 5,000 feet

Figure 2-11
Potential Offsite Materials Placement Sites

Path: P:\2009\09080064_SELRP_EIR\6.0 GIS\6.3 Layout\EIR_EIS\DisposalOverview.mxd, 7/2/2014, steinb

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Source: SANDAG 2012; MoffattNichol; AECOM 2014

500 250 0 500 Feet

Scale 1:6,000; 1 inch = 500 feet

Figure 2-11A
Materials Placement Site
Leucadia

Path: P:\2009\09080064_SELRP_EIR\6.0 GIS\6.3 Layout\EIR_EIS\Disposal_Sites_series.mxd, 7/23/2014, janssenn

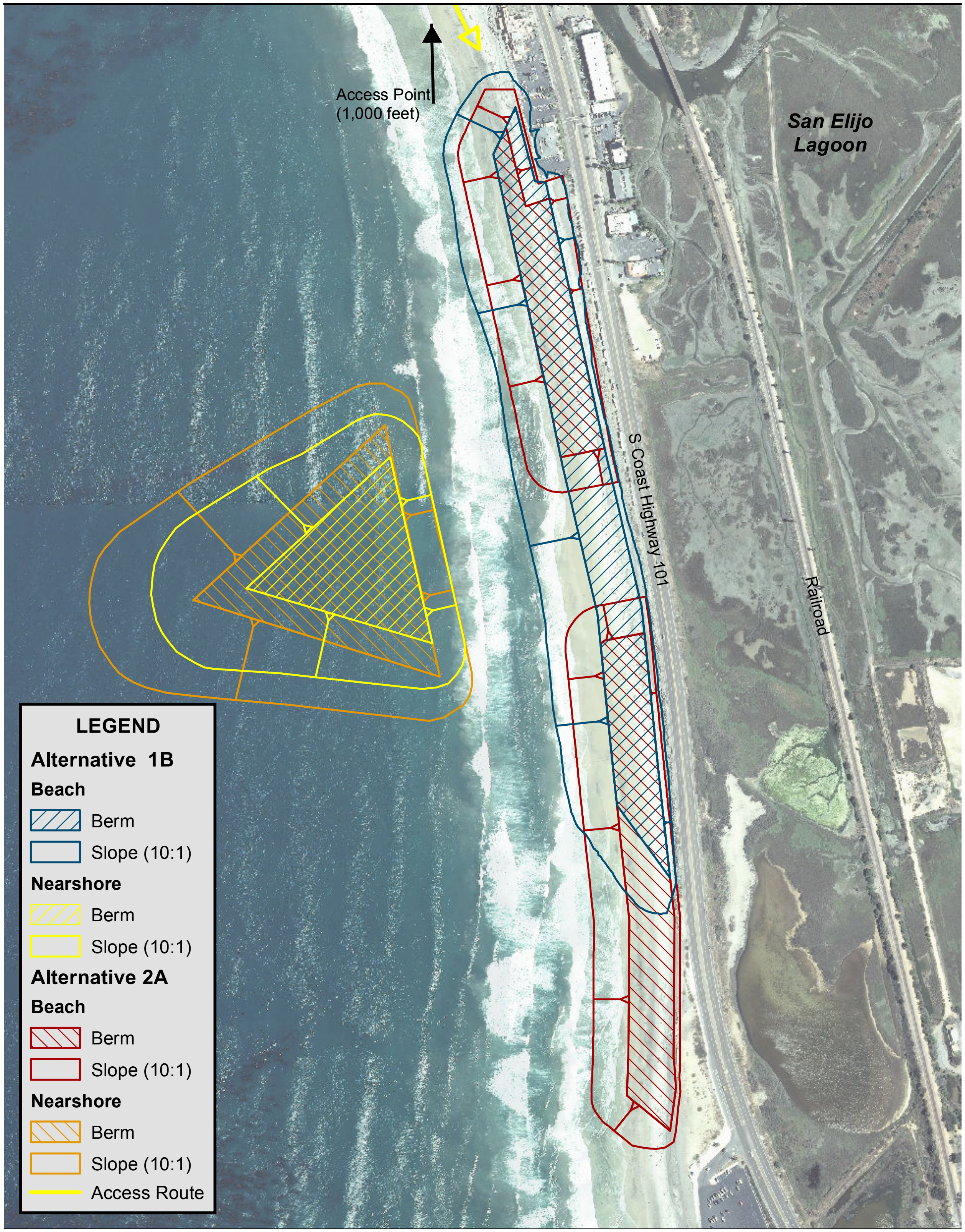
Source: SANDAG 2012; MoffattNichol; AECOM 2014

500 250 0 500 Feet

Scale 1:6,000; 1 inch = 500 feet

Figure 2-11B
Materials Placement Site
Moonlight Beach

Path: P:\2009\09080064_SELRP_EIR\6.0 GIS\6.3 Layout\EIR_EIS\Disposal_Sites_series.mxd, 7/23/2014, janssenn



Source: SANDAG 2012; MoffattNichol; AECOM 2014

500 250 0 500 Feet

Scale 1:6,000; 1 inch = 500 feet

Figure 2-11C
Materials Placement Site
Cardiff Alternatives 1B, 2A

Path: P:\2009\09080064_SELRP_EIR\6.0 GIS\6.3 Layout\EIR_EIS\Disposal_Sites_series.mxd, 7/23/2014, janssenn

Source: SANDAG 2012; MoffattNichol; AECOM 2014

500 250 0 500 Feet

Scale 1:6,000; 1 inch = 500 feet

Figure 2-11D
Materials Placement Site
Solana Beach

Path: P:\2009\09080064_SELRP_EIR\6.0 GIS\6.3 Layout\EIR_EIS\Disposal_Sites_series.mxd, 7/23/2014, janssenn

Source: SANDAG 2012; MoffattNichol; AECOM 2014

500 250 0 500 Feet

Scale 1:6,000; 1 inch = 500 feet

Figure 2-11E
Materials Placement Site
Torrey Pines

Path: P:\2009\09080064_SELRP_EIR\6.0 GIS\6.3 Layout\EIR_EIS\Disposal_Sites_series.mxd, 7/23/2014, janssenn

Table 2-20
Proposed Materials Disposal and Beneficial Reuse Scenarios

<table>
<tr><td colspan="5">Approximate Net Quantity of Material:
Alternative 1A = 160,000 cy of relatively poor-quality material that is only suitable for offshore disposal at LA-5
Alternative 1B = 1.2 mcy (overdredging would occur to generate appropriate material for beneficial reuse)
Alternative 2A = 1.4 mcy (overdredging would occur to generate appropriate material for beneficial reuse)</td></tr>
<tr><th rowspan="2">Type of Materials Placement</th><th rowspan="2">Potential Disposal Locations</th><th colspan="3">Maximum Volumes Proposed for Placement by Site</th></tr>
<tr><th colspan="2">Alternative 2A and Alternative 1B (cy)</th><th>Alternative 1A (cy)</th></tr>
<tr><td>Offshore Disposal</td><td>LA-5</td><td colspan="2">0</td><td>160,000</td></tr>
<tr><td>Offshore Stock-piling (outside littoral cell)</td><td>SO-5/SO-6</td><td colspan="2">1,000,000</td><td>0</td></tr>
<tr><td rowspan="2">Nearshore (inside littoral cell)</td><td rowspan="2">Cardiff</td><td>Alternative 2A</td><td>Alternative 1B</td><td rowspan="2">0</td></tr>
<tr><td>500,000</td><td>300,000</td></tr>
<tr><td rowspan="5">Onshore (beach placement)</td><td>Cardiff</td><td colspan="2">300,000</td><td>0</td></tr>
<tr><td>Leucadia</td><td colspan="2">117,000</td><td>0</td></tr>
<tr><td>Moonlight Beach</td><td colspan="2">105,000</td><td>0</td></tr>
<tr><td>Solana Beach</td><td colspan="2">146,000</td><td>0</td></tr>
<tr><td>Torrey Pines</td><td colspan="2">245,000</td><td>0</td></tr>
</table>

Notes:
General – The disposal/placement sites have not yet been approved. The disposal/reuse scenario will be identified once the final SAP is reviewed and approved by the Corps and EPA.
1. Nearshore materials placement quantity at Cardiff is greater in Alternative 2A because a new inlet would require construction of a prefilled ebb bar (Section 2.4).
2. Materials placement quantities exceed amount to be disposed of, or reused, to allow flexibility at individual placement sites.
3. Onshore beach sand placement sites are consistent with the 2012 RBSP (SCH # 2010051063) with the exception of Cardiff, which would extend slightly farther north and south along the coastline. Refer to Figure 2-11 for the proposed project's sand placement sites. While 2012 RBSP sites are proposed for use, the SELRP would obtain permits for placement, since the 2012 RBSP was a one-time project implemented in 2012.
4. Sand Compatibility and Opportunistic Use Programs (SCOUP) sites are not included as an option for materials placement in this EIR/EIS because the existing SCOUPs assume construction methods and other conditions that are not consistent with the SELRP (e.g., daytime construction only).

cy = cubic yards
mcy = million cubic yards

2.10 CONSTRUCTION METHODS, SCHEDULE, AND PROJECT DESIGN FEATURES

The SELRP would be constructed over several phases and require unique approaches and equipment. This section provides a description of possible construction methods associated with both the lagoon restoration and materials disposal/reuse components of the proposed project. In addition, potential phasing and scheduling features are identified. Specific project design features that have been incorporated into the project design to minimize or avoid potential effects to resources are also detailed in this section. Construction may be accomplished using various methods; this section of the EIR/EIS presents a conservative scenario for disclosure purposes, but the actual construction approach may be refined during final design and/or in the contractor bid phase.

Project construction is assumed to occur concurrently with construction of two other projects at the lagoon to minimize overall environmental impacts and the duration of disturbance within the lagoon, as required by Senate Bill 468 (see Section 1.5). The two projects are the I-5 bridge replacement proposed by Caltrans as part of the I-5 North Coast Corridor Project improvements and the LOSSAN Project proposed by SANDAG. Both of these projects are corridor-wide program planning efforts and are undergoing separate environmental review. Though independent projects, coordination is ongoing with them to maximize the efficiency and environmental sensitivity of overall construction activities in the lagoon. For evaluation purposes, each is considered as a cumulative project in Chapter 5 of this EIR/EIS.

Generally, construction would consist of:

1. Dredging and grading within the lagoon to raise or lower elevations to create a diverse mosaic of habitats that remains resilient through time.
2. Modifications to the existing lagoon inlet to enhance tidal flow in and out of the lagoon, and internal lagoon bathymetric modifications to increase the tidal prism within the lagoon basins and the rate of water transfer between the ocean and lagoon.
3. Infrastructure improvements and protection, as necessary, including bridge retrofitting or construction along Coast Highway 101.
4. Disposal of sediments excavated from the lagoon to different locations, as identified for materials disposal/reuse, including offshore disposal areas, offshore placement sites, nearshore areas, nearby beaches, and/or on-site placement. Two of the project alternatives would allow for construction of an overdredge pit within the lagoon to provide on-site disposal of fine material. This approach would also generate material that could potentially be beneficially reused in the littoral system.
5. Restoration of graded areas within the lagoon to facilitate recovery of habitat.

Construction in a lagoon environment is challenging and can be complex. Several methods are typically required to coordinate working with dredges over water and earthmoving equipment over land. Often a combination of approaches is utilized, particularly in a large site such as San Elijo Lagoon. Construction scenarios proposed under each alternative are presented below, along with general information about the timing and duration of anticipated activities. This discussion provides a construction approach for Alternative 2A, as the proposed project, and then provides information for Alternative 1B and Alternative 1A, which would generally result in incrementally less effort including duration and/or phasing. Figures 2-12 through 2-14 show potential disturbance limits for each alternative, while Figure 2-15 shows access and staging areas for each of the build alternatives and illustrates the system of dikes that would be constructed to allow flooding of specific areas while retaining refugia in other parts of the lagoon. These dikes are required to control flooding necessary to conduct dredging throughout the lagoon.

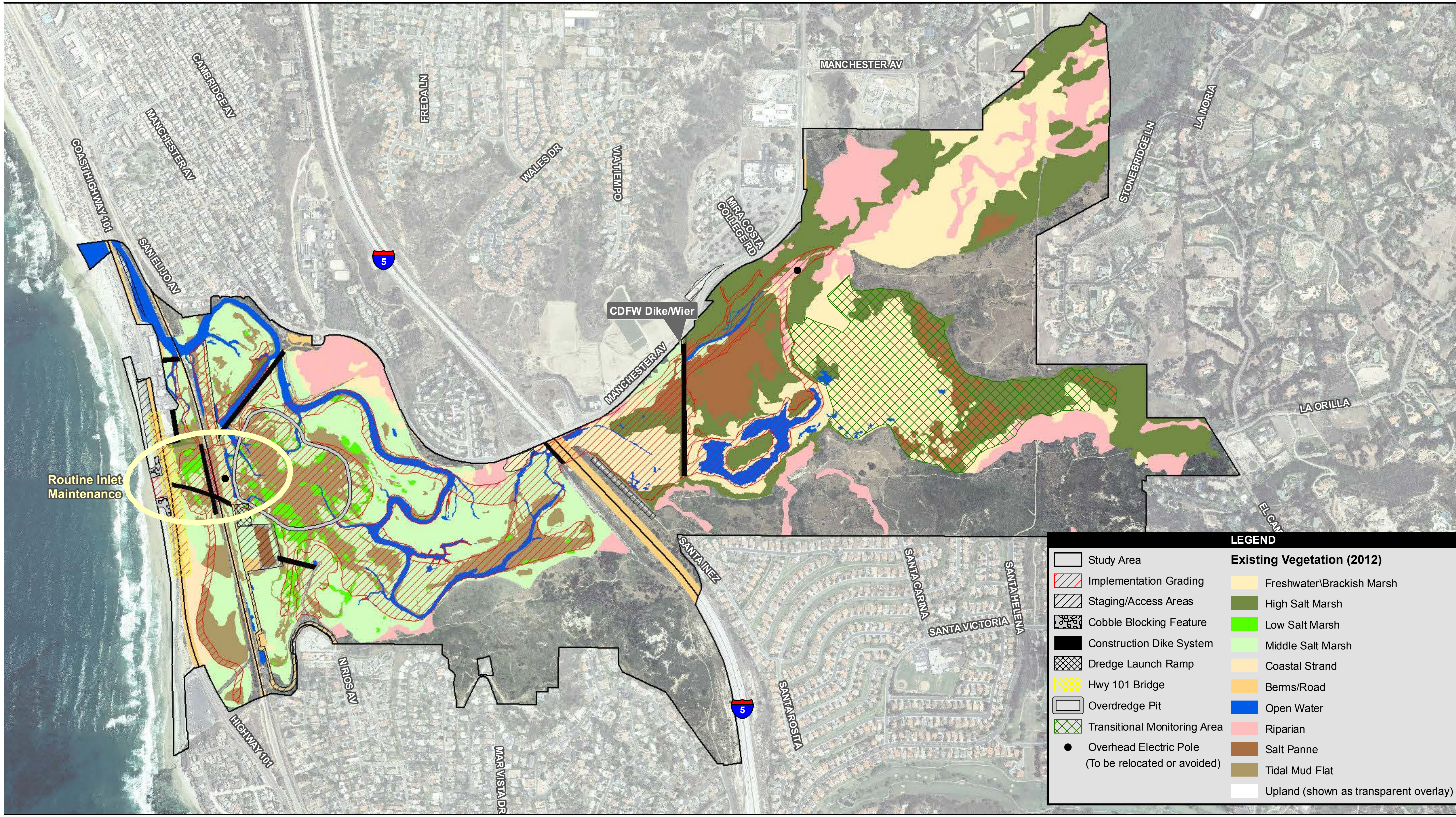
Construction is anticipated to start in January 2016, but this schedule may change based on approvals and authorizations needed for project implementation. A period of up to approximately 36 months of active construction is anticipated for project implementation. Work would generally consist of site preparation and mobilization, construction of dikes to contain and limit flooding needed to conduct dredging, flooding of specific basins and areas while dredging occurs, and draining of flooded areas to allow basins to begin recovery and provide refugia while other basins are under construction. Although the work would generally occur in sequenced phases, it is anticipated that construction would occur year-round and these phases would be implemented without pause. Figures 2-16 and 2-17 illustrate the proposed construction phasing and sequencing for Alternative 2A and Alternative 1B, respectively. Some construction activities would be restricted to daytime hours, but some activities require 24 hours a day of operation to remain efficient (e.g., dredging and materials disposal/placement activities). Additionally, some activities such as materials delivery may be scheduled for nighttime hours to minimize additional effects, such as traffic or circulation (e.g., movement of pedestrians and motorized and/or nonmotorized vehicles) during summer hours. These nighttime activities may require limited temporary lighting for safety purposes. Phasing would allow the SELC to incorporate restrictions on specific construction activities to minimize effects to sensitive resources within the lagoon. For example, clearing and grubbing of habitat areas would be restricted to outside of the bird breeding season to limit effects to breeding bird populations. Other examples are outlined in the project design features table at the end of this section (Table 2-25).

2.10.1 CONSTRUCTION APPROACH

Alternative 2A–Proposed Project

Construction Phasing and Sequencing

Table 2-21 outlines the anticipated sequence of activities and general durations for each phase of implementation of Alternative 2A–proposed project. Construction of Alternative 2A–proposed project could take up to approximately 36 months. This alternative would require construction of a bridge along Coast Highway 101 at the new inlet location, which would occur concurrently with lagoon enhancement work. Figure 2-12 shows potential disturbance limits for Alternative 2A. Phasing and sequencing for the proposed project related to specific areas designated for flooding and dredging are illustrated in Figure 2-16.



Source: SANDAG 2012; MoffattNichol; AECOM 2013

1,100 550 0 1,100 Feet

Scale: 1:13,200; 1 inch = 1,100 feet

Figure 2-12
Alternative 2A
Limits of Disturbance

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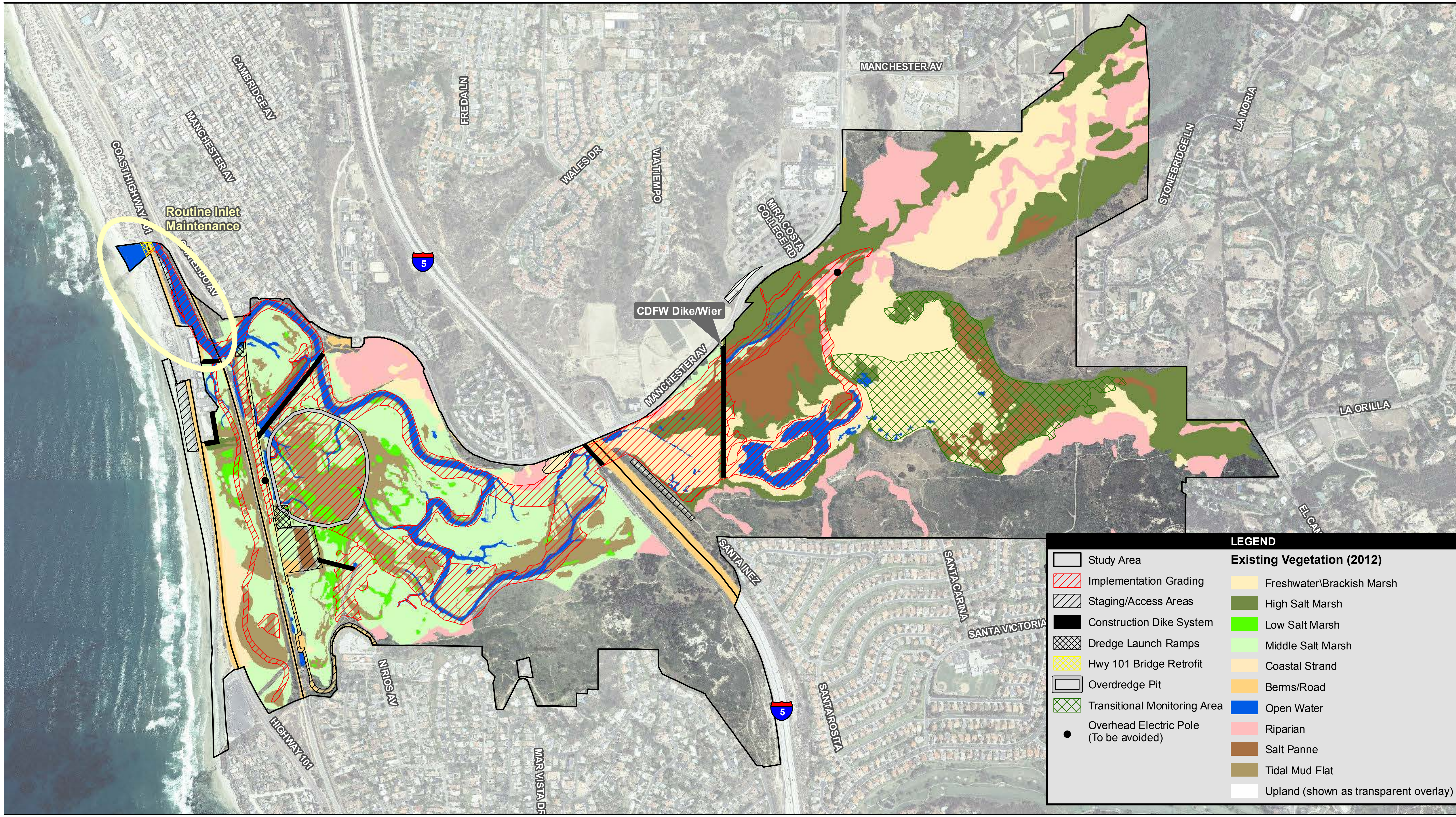

Source: SANDAG 2012; MoffattNichol; AECOM 2013

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Scale: 1:13,200; 1 inch = 1,100 feet

Figure 2-13
Alternative 1B
Limits of Disturbance

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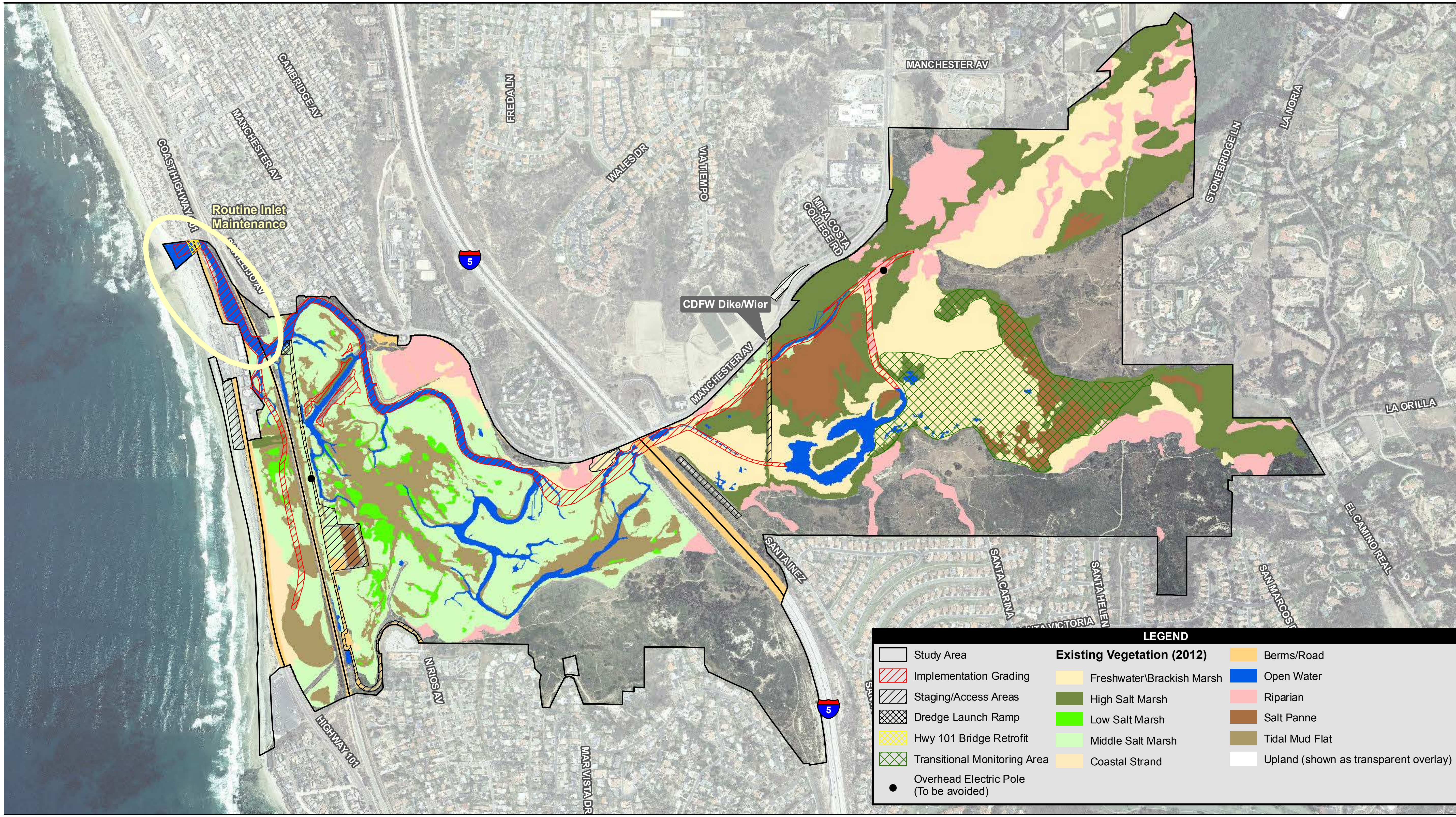

Source: SANDAG 2012; MoffattNichol; AECOM 2013

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Scale: 1:13,200; 1 inch = 1,100 feet

Figure 2-14
Alternative 1A
Limits of Disturbance

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Source: SANDAG 2012; MoffattNichol; AECOM 2013

1,100 550 0 1,100 Feet

Scale: 1:13,200; 1 inch = 1,100 feet

Access/Staging Notes:
Alternative 2A Includes All Sites (1-10)
Alternative 1B Includes All Sites except for 4
Alternative 1A Includes All Sites except for 2, 4 and 6

Dike Notes:
Construction Dike System Numbered 1-8
Dike 3 Utilizes Existing CDFW Dike Prior to Removal/Improvement

P indicates employee parking area

Figure 2-15
Access/Staging Areas and Construction Dike System

Path: P:\2009\09080064_SELRP_EIR\6.0 GIS\6.3 Layout\EIR_EIS\Access_and_Staging_Areas.mxd, 5/19/2014, steinb

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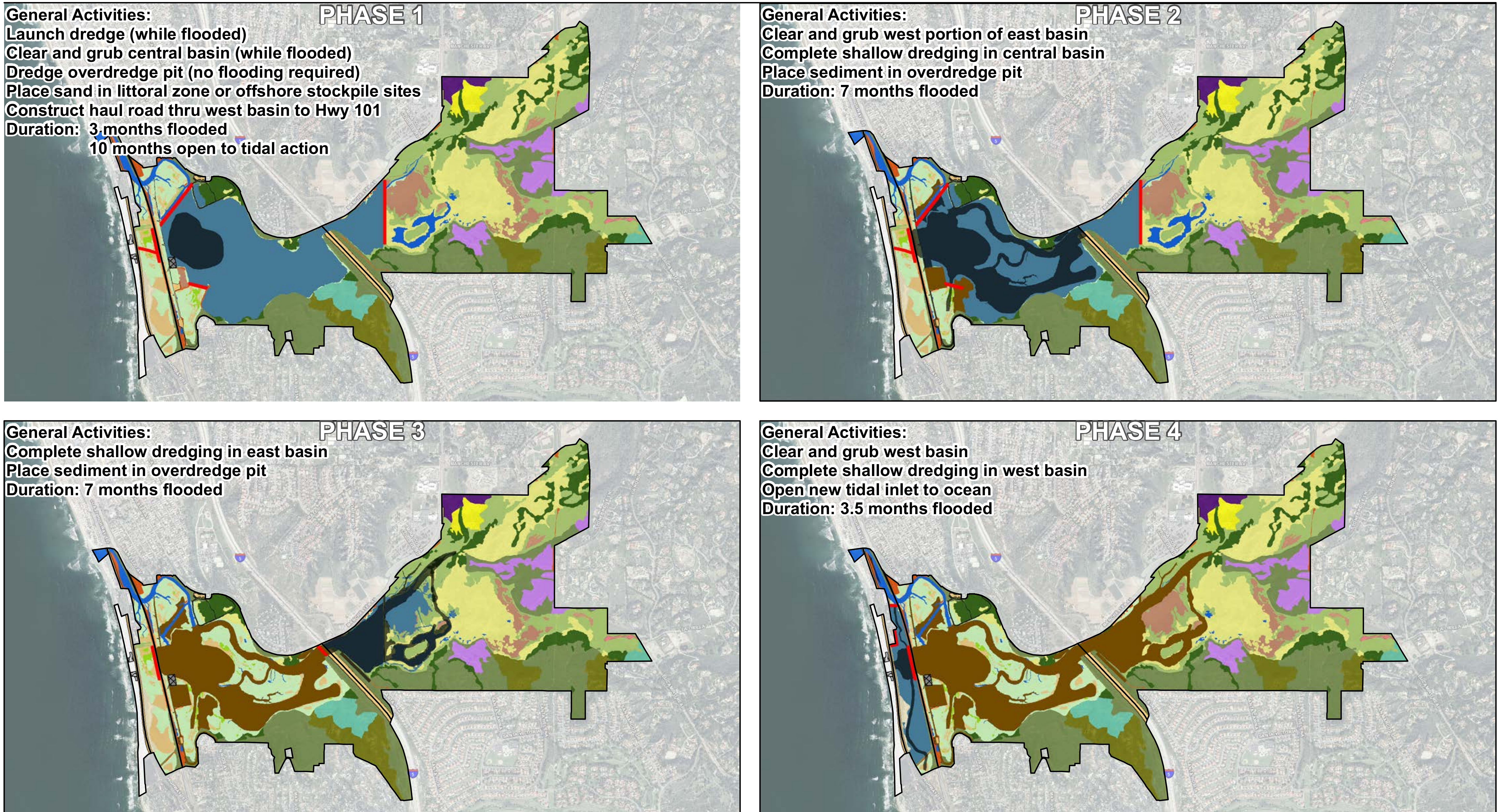

Source: Landiscor 2010; AECOM 2012

0.5 0.25 0 0.5 Mile

LEGEND

- StudyArea
- Construction Dike System
- Construction Inundation/Flooding
- Dredged while Inundated
- Restoration/Access (Post-Disturbance)
- Cobble Blocking Features
- Dredge Launch Ramp

Figure 2-16
Construction Sequence
Alternative 2A

Path: P:\2009\09080064_SELRP_EIR\6.0 GIS\6.3 Layout\EIR_EIS\Alt2a_ConstructionSequence_Images_JS20140606.mxd, 6/6/2014, sorensenj

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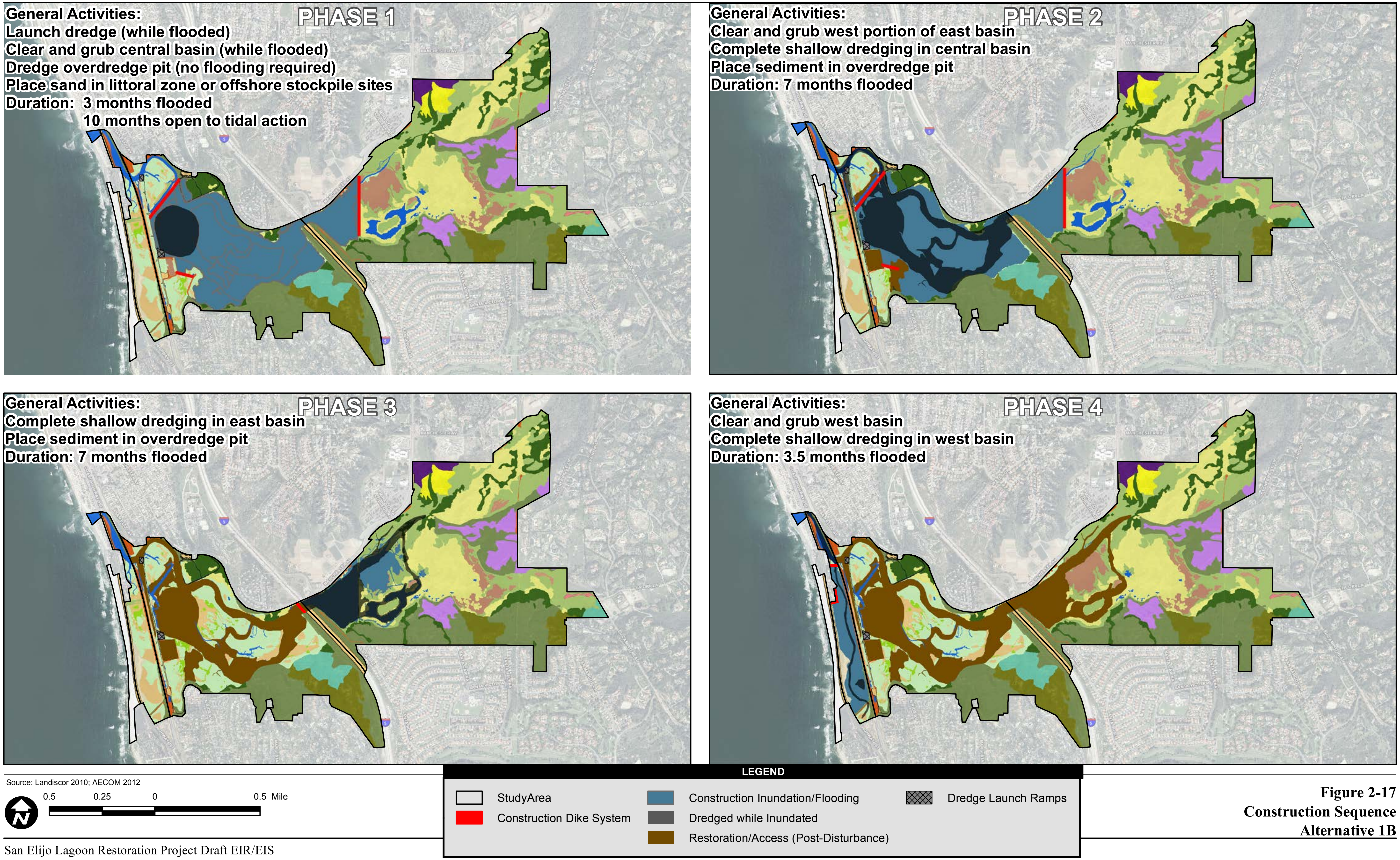

Source: Landiscor 2010; AECOM 2012

Figure 2-17
Construction Sequence
Alternative 1B

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Table 2-21
Anticipated Construction Phasing Schedule – Alternative 2A

	Phase 1	Phase 2	Phase 3	Phase 4
Activity	Construct dikes (1 & 2) in central basin and confirm/improve CDFW dike (3) to prevent flooding to the east Close dike 1 at low tide to leave dry and create refugia for species Close dike 2 at high tide and perch water elevation up to +6 feet NGVD to launch and float dredge Clear/grub central basin vegetation of 25,000 cy (3 months) in dredge area and export to disposal location through site access (#7) Reopen dike 2 after dredge reaches the overdredge pit location, leaving the lagoon open to tidal action Overdredge pit of 1.4 mcy and pump sand to onshore/ nearshore/offshore placement sites (10 months) Complete North Rios access road improvements and other staging/access area preparation (including site 7 with 5,000 cy of imported earth material)	Again, close dike 2 at high tide to perch water at +6 feet NGVD in central basin and west portion of east basin Dredge central basin over 7 months • widespread dredging (650,000 cy) in central basin to overdredge pit • construct central basin transitional areas • clear and grub central basin at channels (60,000 cy) • clear and grub east basin between I-5 and CDFW dike (240,000 cy) Construct dike 4 under I-5 to enable flooding of entire east basin during Phase 3 Release dike 2 and open central basin to tidal action and recovery	Maintain flooding in east basin to +5 NGVD using dike 4 and lower CDFW dike 3 Clear/grub east basin east of CDFW dike (30,000 cy) Dredge east basin to overdredge pit over 7 months (700,000 cy) Construct east basin transitional areas Lower dike 4 under I-5 and open east basin to tidal action and recovery	Build dike 5 and protective dike in west basin (6) Close dike 5 at high tide to flood west basin to +6 feet NGVD Clear/grub west basin (10,000 cy) Dredge to create inlet and subtidal basin (200,000 cy) to overdredge pit, nest site, and/or littoral cell placement sites Open new tidal inlet to ocean Lower dikes, leaving lagoon open to tidal action through new tidal inlet
Flooding Requirements (Duration/ Elevation)	After closing central basin dike 2, flood central basin to +6 feet NGVD for up to 3 months (initiate outside of breeding season) to launch dredge and clear and grub central basin, then drain and complete dredging of overdredge pit for 10 months while lagoon is open to tidal action	Flood central basin to +6 feet NGVD for 7 months to allow shallow dredging; flood east basin between I-5 and CDFW dike for clear and grub (6 months); west basin remains open to tidal action	Flood east basin for 7 months to +5 feet NGVD to allow shallow dredging; central and west basins remain open to tidal action	Flood west basin for 4 months to +6 feet NGVD to allow shallow dredging of west basin; remainder of lagoon remains open to tidal action

	Phase 1	Phase 2	Phase 3	Phase 4
Quantity/ Equipment	Clear and grub 25,000 cy with barge and haul trucks Dredge 1.4 mcy with a large dredge Road and staging/access point preparation equipment, such as bulldozers, backhoes, front-end loaders, earthmovers, graders Import of 10,000 cy of gravel from off-site for road/staging sites Import of 5,000 cy of earthen material for site 7 preparation (from I-5 North Coast Corridor Project) Import up to 50,000 cy of material for dike construction (from I-5 North Coast Corridor Project)	Clear and grub 300,000 cy with barge and haul trucks Dredge 650,000 cy with smaller dredge(s)	Clear and grub 30,000 cy with barge and haul trucks Dredge 700,000 cy with smaller/mid-size dredge(s)	Clear and grub 10,000 cy with barge and haul trucks Dredge 150,000 cy with a smaller dredge and place in pit as 50,000 cy of backfill (silts) and cover with up to approximately 130,000 cy sand cap; Excavate inlet under Coast Highway 101 (<50,000 cy of sand) with earthmoving equipment to the nest site and the beach
Coast Highway 101 Work	Start Coast Highway 101 Detouring – Build Bridge and Approaches; construct dike 7 and haul road through southern portion of west basin	Continue Coast Highway 101 Detouring – Build Bridge and Approaches	Complete Coast Highway 101 Detouring – Build Bridge and Approaches	No work on Coast Highway 101
General Timeline	Winter 2016 –Winter 2017	Winter 2017 – Fall 2018	Fall 2018 – Spring 2019	Spring – Fall 2019

Notes:
1. Mobilization of specific equipment would occur prior to each phase. Activities associated with mobilization/demobilization would not occur within lagoon-sensitive habitats outside the proposed disturbance footprint. Areas within the disturbance footprint may experience vegetation clearing and/or grading.
2. These phases anticipate a start date of January 2016. If the schedule is shifted, restrictions on specific activities (e.g., clear and grub and the initiation of flooding would occur outside the breeding season) would continue to be implemented per Table 2-25.

CDFW = California Department of Fish and Wildlife; cy = cubic yards; I-5 = Interstate 5; mcy = million cubic yards; NGVD = National Geodetic Vertical Datum

Alternative 2A–proposed project would allow for construction of an overdredge pit within the central basin to provide on-site disposal of fine material removed from shallow cuts throughout the central, east, and west basins. These fine materials are not suitable for beneficial reuse through placement on beaches or in the littoral zone. Materials dredged from the overdredge pit would be from deeper, more coarse-grained sediments that are anticipated to be suitable for beneficial reuse in the littoral system based on soil investigations (M&N 2013). Phase 1 would create the pit by removing up to 1.4 mcy from the proposed overdredge pit area in the central basin (underlying the mudflat/channel area shown in Figure 2-3).

Work could occur using a cutterhead suction dredge or similar equipment that would likely be mobilized to the site by truck, assembled on-site, and launched into the basin. Sand would be pumped from the lagoon to various placement sites by pipe and/or by a transport vessel located offshore. A diesel or electric dredge could be used; if the dredge is electric, facilities for electrical power would be provided in the form of a small (10 feet by 10 feet and 8 feet high) temporary on-site electrical substation located within staging area 5 (Figure 2-15). This facility is further described in Section 2.10.2 and would only remain on-site during construction.

Dredging and Flooding Requirements

The overdredge pit proposed as part of Alternative 2A–proposed project would be created during Phase 1 of construction to provide a location for finer materials disposal later in the construction process. The location of the overdredge pit is shown in Figures 2-12 and 2-13. Phase I also includes clearing and grubbing of the central basin while it is flooded for 3 months. The overdredge pit would be dredged by launching a dredge into the central basin and allowing it to remain in the basin until dredging is complete to provide the required capacity. This dredging procedure does not require flooding of the central basin for an extended period, but only for a time sufficient to launch the dredge, move it to the pit location, and dredge a small subtidal working area to initiate large-scale dredging. Overdredge pit dredging can occur during open lagoon mouth conditions and is expected to take 10 months.

Once creation of the overdredge pit has been completed, shallow dredging of finer materials not suitable for reuse within the littoral zone would occur in specific locations under Alternative 2A and Alternative 1B. This would occur in Phase 2 of the project. Prior to shallow dredging proposed throughout the remainder of the lagoon, portions of the lagoon would need to be flooded with the use of strategically placed dikes to approximately +6 feet NGVD (central basin, and east to the CDFW dike in the east basin) to adequately accommodate a dredge. The west portion of the east basin would also flood back to the existing CDFW dike during this phase. The dike would be left in place and improved, as necessary, to prevent extended inundation of riparian habitat areas east of the dike. The east basin would continue to capture inputs from upstream, and to protect existing sensitive brackish and riparian habitat, water levels east of the CDFW dike would be maintained at elevations less than +5 feet NGVD. Pipes would be placed over the containment dike(s) to allow water to be pumped into or out of the lagoon to maintain a relatively consistent depth (e.g., releasing excess freshwater flows or adding replacement water, as needed, the dredge discharges its slurry outside of the flooded area). After construction of the dikes and water level control equipment, the lagoon could be flooded by closing the dikes at high tide. Shallow dredging throughout the basins could then occur; dredged materials from shallow cuts made within the basin would be placed in the overdredge pit via a temporary pipeline extending through the lagoon.

Three distinct areas have been identified as refugia for sensitive species during flooding, along the northwest side of the central basin, southeast of the former sewage ponds within the central basin, and the west basin itself. Containment dikes would be required to maintain the two refugia areas in the central basin, but the west basin would remain either dry or open to tidal influence until dredging occurs within that basin in Phase 4. Dikes would be constructed using existing access roads. It is not anticipated that earthen material would need to be imported from off-site. Earthen material needed for internal fill for lagoon restoration would come from the I-5 bridge construction project that would yield a high volume of surplus material. Approximately 155,000 cy of surplus material could be transferred from the I-5 bridge construction site to on-site stockpile staging locations in haul trucks. Approximately 50,000 cy of material would be required to construct the dikes. Earthmoving equipment would utilize existing access roads (e.g., along the railroad) and then begin to construct a raised platform out into the lagoon from those disturbed edges at the proposed locations. Approximately 10,000 cy of gravel would be imported from off-site to improve the internal road network sufficiently to support the work. Another 5,000 cy of material would be imported to prepare site 7 along Manchester Avenue in the central basin.

The containment dike within the southern part of the central basin would be closed off at low tide to reduce the water volume trapped in the refugia area within the southwest part of the central basin. The containment dike within the northern part of the central basin would be closed off at high tide to retain as much water within the dredge area as possible. The two dikes in the central basin would remain closed until the end of Phase 2, with a period of time when the northwest dike 2 would be breached to allow tidal action while the main overdredge pit is being created during Phase 1. In Phase 1, approximately 1.4 mcy of sediment would be dredged and beneficially reused in the littoral zone nearshore and/or onshore placement, or staged immediately outside of the littoral zone (offshore stockpiling). Up to approximately 130,000 cy of sand would be retained to cap the overdredge pit at the end of Phase 4. A sand cap is required for Alternative 2A–proposed project because the new inlet results in a higher energy condition at the pit location compared to the existing inlet alternative of 1B.

Flooding of the central basin would last up to approximately 3 months in Phase 1, and 7 months in Phase 2, with an interim period of approximately 10 months during Phase 1 when no flooding would be required while the overdredge pit is created. After Phase 2, flooding of the central basin would be released to open the basin to tidal action and allow for habitat recovery to begin.

Phase 2 would dredge approximately 650,000 cy of silts and clays from the central basin and discharge it into the overdredge pit. A small quantity of material (approximately 35,000 cy) would also be placed at three man-made transitional areas within this basin after dewatering in the former sewage ponds (staging area 5 in Figure 2-15). It is anticipated that this work would occur using one or more cutterhead suction dredges. Dredge(s) would be mobilized to the site by truck, assembled on-site, and launched into the basin.

At the end of Phase 2, the east basin would remain flooded at a maximum water elevation of +5 NGVD through construction of a dike at I-5 and removal of the CDFW dike, and shallow dredging within that basin would occur in Phase 3. Dredged materials from that basin would be placed in the overdredge pit via a temporary pipeline extending through the lagoon. Phase 3 would dredge approximately 700,000 cy of silts and clays from the east basin and discharge it into the overdredge pit, with approximately 10,000 cy being placed at one man-made transitional area after dewatering. It is anticipated this work would also be completed using cutterhead suction dredges. Flooding of the east basin would last up to approximately 7 months for dredging. After Phase 3, containment dike 4 would be removed and flooding released to open the basin to tidal action and allow for habitat recovery to begin.

During Phase 4, the west basin would be flooded by constructing a dike at the channel entrance and allowing a high tide to flood the area or by pumping water into the basin. Additional dikes may be required within the west basin during flooding to protect adjacent low-lying development, as shown in Figure 2-16. Phase 4 would dredge approximately 150,000 cy of silts, clays, and sand from the west basin, and use earthmoving equipment outside of the dredge area to excavate another approximately 50,000 cy of sand from under the new Coast Highway 101 bridge at the proposed tidal inlet location. Silts and clays would be discharged into the overdredge pit. Up to approximately 130,000 cy of sand would be used to cap the pit and approximately 35,000 cy of sand would be placed at the proposed nesting site, with the balance (35,000 cy) going to the beach for onshore or nearshore placement. It is anticipated this work would be completed using a small cutterhead dredge plus excavators, backhoes, scrapers, bulldozers, and possibly offroad trucks for earthmoving activities at the tidal inlet. The proposed inlet would be opened as the last construction task, and the existing inlet allowed to gradually close over time.

Coast Highway 101 Construction Activities

Under Alternative 2A, a new Coast Highway 101 bridge would be constructed over the new inlet as fully detailed in Section 2.10.10. Construction on Coast Highway 101 associated with Alternative 2A would last approximately 18 months and occur concurrently with lagoon restoration activities. Figure 2-5 illustrates the proposed construction approach for the new bridge structure. Work on the west and east halves of the roadway would be conducted sequentially, allowing for one side of the new bridge to be constructed and poured first, while traffic would use the other half of existing Coast Highway 101 to maintain continual access in both directions. Details are provided in Section 2.10.

Alternative 1B

Construction Phasing and Sequencing

Table 2-22 describes generalized construction phases of work for Alternative 1B. This alternative would also include retrofitting the existing bridge along Coast Highway 101, which would occur concurrently with lagoon enhancement work. Figure 2-13 shows potential disturbance limits for Alternative 1B. Phasing for the project related to specific areas designated for flooding and dredging is illustrated in Figure 2-17. Implementation of Alternative 1B would incorporate similar phasing for construction activities as that presented for Alternative 2A–proposed project.

Table 2-22
Anticipated Phasing Schedule – Alternative 1B

	Phase 1	Phase 2	Phase 3	Phase 4
Activity	Construct dikes (1 & 2) in central basin and confirm/improve CDFW dike (3) to prevent flooding to the east Close dike 1 at low tide to leave dry and create refugia for species Close dike 2 at high tide and perch water elevation up to +6 feet NGVD to launch and float dredge to overdredge pit location Clear/grub central basin vegetation of 25,000 cy (3 months) in dredge area and export to disposal location through site access (7) Reopen dike 2 after dredge reaches overdredge pit location, leaving lagoon open to tidal action	Again, close dike 2 at high tide to perch water at +6 feet NGVD in central basin and west portion of east basin Clear and grub channel areas in the CB (60,000 cy) Dredge central basin over 7 months • widespread dredging in central basin to overdredge pit (550,000 cy) • construct central basin transitional areas • clear and grub east basin between I-5 and CDFW dike (240,000 cy)	Maintain flooding in east basin to +5 NGVD using dike 4 and lower CDFW dike 3 Clear/grub east basin east of CDFW dike (30,000 cy) Dredge east basin (700,000 cy) to overdredge pit (7 months) Construct east basin transitional areas Lower dike 4 under I-5 and open east basin to tidal action and recovery	Build dike 5 and protective dike in west basin (6) Close dike 5 at high tide to flood west basin to +6 feet NGVD Clear/grub west basin (10,000 cy) Dredge channel network in basin to overdredge pit, nest site, and/or littoral cell placement sites Lower dikes, leaving basin and rest of lagoon open to tidal action

	Phase 1	Phase 2	Phase 3	Phase 4
	Overdredge pit of 1.2 mcy and pump sand to onshore/nearshore/offshore placement sites (10 months) Complete North Rios access road improvements and other staging/access area preparation (including site 7 with 5,000 cy of imported earth material)	Construct dike 4 under I-5 to enable flooding of entire east basin during Phase 3 Release dike 2 and open central basin to tidal action and recovery		Clear tidal inlet and channel to design dimensions
Flooding Requirements (Elevation and Duration)	After closing central basin dike 2, flood central basin to +6 feet NGVD for up to 3 months (initiate outside of breeding season) to launch dredge and clear and grub central basin, then drain and complete dredging of overdredge pit for 10 months while lagoon is open to tidal action	Flood central basin for 7 months to allow shallow dredging; flood east basin between I-5 and CDFW dike for duration of clear and grub (6 months); west basin remains open to tidal action	Flood east basin for 7 months to +5 feet NGVD to allow shallow dredging; central and west basins remain open to tidal action	Flood west basin to +6 feet NGVD for up to 4 months to allow shallow dredging of west basin; remainder of lagoon remains open to tidal action
Quantity/ Equipment	Clear and grub 25,000 cy with barge and haul trucks Dredge 1.2 mcy with a large dredge Road and staging/access point preparation equipment, such as bulldozers, backhoes, front-end loaders, earthmovers, graders Import of materials for road/staging sites (10,000 cy) Import of 5,000 cy of earthen material for site 7 preparation Import of material for dike construction (up to 50,000 cy)	Clear and grub 300,000 cy with barge and haul trucks Dredge 550,000 cy with smaller dredge(s)	Clear and grub 30,000 cy with barge and haul trucks Dredge 700,000 cy with smaller/mid-size dredge(s); cap pit with up to 130,000 cy of sand from the lower layers, allow room for additional backfill and capping in Phase 4.	Clear and grub 10,000 cy with barge and haul trucks Dredge 50,000 cy with a smaller dredge and place in pit as 50,000 cy of backfill (silts), and/or use sand for nesting site.
Coast Highway 101 Work	Potential retrofit activities for Coast Highway 101 initiated – create detours on roadway and drill pilings for retrofit	Continue Coast Highway 101 retrofit activities	Continue Coast Highway 101 retrofit activities	No work on Coast Highway 101

	Phase 1	Phase 2	Phase 3	Phase 4
General Timeline	Winter 2016 –Winter 2017	Winter 2017 – Fall 2018	Fall 2018 – Spring 2019	Spring – Fall 2019

Notes:

1. Mobilization of specific equipment would occur prior to each phase. Activities associated with mobilization/demobilization would not occur within lagoon-sensitive habitats outside the proposed disturbance footprint. Areas within the disturbance footprint may experience vegetation clearing and/or grading.
2. These phases anticipate a start date of January 2016. If the schedule is shifted, restrictions on specific activities (e.g., clear and grub and the initiation of flooding would occur outside the breeding season) would continue to be implemented per Table 2-25.

CDFW = California Department of Fish and Wildlife; cy = cubic yards; I-5 = Interstate 5; mcy = million cubic yards; NGVD = National Geodetic Vertical Datum

Similar to Alternative 2A, Alternative 1B would allow for construction of an overdredge pit within the central basin to provide on-site disposal of fine material not suitable for beneficial reuse. Phase 1 would create the pit by removing up to 1.2 mcy from the proposed overdredge pit area in the central basin (underlying the mudflat/channel area shown in Figure 2-17). As with Alternative 2A, work could occur using a cutterhead suction dredge, or similar equipment and sand would be pumped from the lagoon to various placement sites by pipe and/or by a transport vessel located offshore. If the dredge is electric, a small (approximately 10 feet by 10 feet and 8 feet high) temporary on-site electrical substation would be required as described in Section 2.10.2.

Dredging and Flooding Requirements

Similar to Alternative 2A, restoration of the lagoon under Alternative 1B requires dredging an overdredge pit first, with materials placement in various nearby offshore, nearshore, and onshore locations. Creation of the overdredge pit would be followed by shallower dredging of habitat areas, with material disposal into the overdredge pit. The construction approach to create the overdredge pit would be similar to that described for Alternative 2A. Prior to shallow dredging proposed throughout the remainder of the central basin, dike 2 would be closed a second time and the central basin of the lagoon would be flooded to approximately +6 feet NGVD to accommodate a dredge. Similar to the approach described for Alternative 2A, temporary dikes 1 and 2 would be constructed to constrain flooded areas and provide refuge for sensitive resident birds. Dikes would be constructed using existing access roads and material excavated from the lagoon and/or imported from off-site. Approximately 50,000 cy of material would be required to construct the dikes. Earthmoving equipment would utilize existing access roads (e.g., along the railroad) and then begin to construct a raised platform out into the lagoon from those disturbed edges at the proposed locations. Approximately 10,000 cy of gravel would be imported from off-site to improve the internal road network sufficiently to support the work, and 5,000 cy of earthen material may be imported to prepare Site 7 along Manchester Avenue in the central basin.

After flooding the central basin, Phase 2 would dredge approximately 550,000 cy of silts and clays from the flooded area and discharge it into the overdredge pit. A small quantity of material (approximately 35,000 cy) would also be placed at three man-made transitional areas within this basin after dewatering at the former sewage pond site (shown as Site 5 in Figure 2-15). It is anticipated that this work would occur using one or more cutterhead suction dredges. Clearing and grubbing of the east basin west of the CDFW dike would also occur in this phase.

Phase 3 would dredge approximately 700,000 cy of silts and clays from the east basin and discharge it into the overdredge pit, with approximately 10,000 cy being placed at one man-made transitional area after dewatering. Sand from the lower layer of the east basin would cap the overdredge pit with a 3-foot minimum sand cap (up to approximately 130,000 cy). It is anticipated this work would also be completed using cutterhead suction dredges.

Phase 4 would dredge approximately 50,000 cy of silts, clays, and sand from the west basin for use in creating man-made transitional habitat. Silts and clays would be dewatered in the proposed nesting site (site 5 in Figure 2-15) prior to its construction. It is anticipated this work would be completed using a small cutterhead suction dredge. The dredge would then move from the west basin to the tidal inlet channel, and dredge 35,000 cy of sand and pump it to the proposed nest site location to complete that component. Removal of the dikes would also be completed in this phase with a backhoe mounted on a barge or from shore locations using a long-arm backhoe. In addition, two footbridges and a path would be installed over the main channel and the channel just east of the utility road, and along the top of the transition area in the central basin. This path and footbridges would link the visitor center loop trail and the end of the utility corridor road, resulting in a complete loop trail around the central basin. Excavating the existing inlet and inlet channel, most likely with land-based earthmoving equipment, to the proposed configuration would be completed as a last task.

Coast Highway 101 Construction Activities

Under Alternative 1B, the existing Coast Highway 101 bridge would be retrofitted by others to increase its seismic stability and correct the existing seismic deficiencies of the structure inlet as fully detailed in Section 2.10.10. Retrofitting of the existing bridge along Coast Highway 101 would last approximately 8 months and could occur at any point in time during the project construction period. Active construction and lane closure along Coast Highway 101 would last approximately 3 months. Retrofit work would likely be phased, and completed under one-half of the existing bridge length while the tidal inlet channel is maintained in position under the other half of the existing bridge. Construction would begin with mobilization of equipment and materials, followed by construction of cast-in-drilled-hole (CIDH) piles, construction of pile caps, and construction of pier walls.

Alternative 1A

Construction Phasing and Sequencing

Table 2-23 illustrates phasing and construction activities associated with Alternative 1A. Construction of this alternative would require approximately 9 months since no overdredge pit would be constructed to provide material suitable for beneficial reuse within the littoral zone. Small volumes of dredged material may be suitable for on-site reuse, but the majority of material would be exported off-site to LA-5 via barge for materials disposal. Figure 2-14 shows potential disturbance limits for Alternative 1A. This alternative would also include retrofitting of the existing bridge along Coast Highway 101, which would occur concurrently with lagoon enhancement work.

Table 2-23
Anticipated Phasing Schedule – Alternative 1A

	Phase 1	Phase 2
Activity	Clear/grub vegetation to be removed along lagoon main channel (if needed); quantity may reach up to 70,000 cy maximum Launch dredge from north end of utility road Dredge in main channel (160,000 cy) and material export/disposal to LA-5	Construct transitional areas Clear tidal inlet and inlet channel to design dimensions and pump sand to nesting area.
Flooding	Not necessary	Not necessary
Quantity/ Equipment	Dredge 160,000 cy with a small, medium, or large dredge; 10,000 cy goes to transition area	Dredge 35,000 cy with smaller dredge or equivalent type of equipment
Coast Highway 101 Work	Retrofit activities for Coast Highway 101 initiated – create detours on roadway and drill pilings for retrofit	Continue Coast Highway 101 retrofit activities
General Timeline	Winter 2016 – Winter 2017	Spring 2018

Notes:
1. Mobilization of specific equipment would occur prior to each phase. Activities associated with mobilization/demobilization would not occur within lagoon-sensitive habitats outside the proposed disturbance footprint. Areas within the disturbance footprint may experience vegetation clearing and/or grading.
2. These phases anticipate a start date of January 2016. If the schedule is shifted, restrictions on specific activities (e.g., clear and grub and the initiation of flooding would occur outside the breeding season) would continue to be implemented per Table 2-25.

cy = cubic yards

Small areas would be used for on-site disposal of dredged material to construct the proposed nesting and transition areas (35,000 cy for the nesting area and 10,000 cy for the transition area, respectively). The majority of the material removed from the lagoon would be disposed of offshore at LA-5. Dredging and grading for Alternative 1A would be focused on enlarging the existing main channel. Limited shallow dredging is proposed, so unlike Alternative 2A and 1B that require extensive flooding of the lagoon basins, no flooding would be required for dredge work for Alternative 1A. Subsequently, no dikes or refugia areas would be needed.

Phase 1 under Alternative 1A would focus on clearing and grubbing the main channel, as needed. The dredge would be launched from the north end of the existing access road within the central basin, and the main channel dredged. Material dredged (approximately 160,000 cy) would be primarily disposed of offshore at LA-5. Phase 2 under Alternative 1A would dredge a small quantity of material (approximately 10,000 cy) to be placed at one man-made transitional area, and 35,000 cy of sand would be placed at the nesting site. It is anticipated that this work would occur using a cutterhead suction dredge. This phase would also clear the tidal inlet and inlet channel to the design dimensions and pump sand to the nesting area.

Coast Highway 101 Construction Activities

Similar to Alternative 1B, no new inlet would be required under Alternative 1A. The existing bridge along Coast Highway 101 would be retrofitted for current seismic deficiencies, however, as described under Alternative 1B. Identical construction methods, equipment, and schedule would be used for Coast Highway 101 retrofitting under Alternative 1A as detailed under Alternative 1B. See Table 2-22 for the general construction timing under Alternative 1A.

2.10.2 Construction Equipment Mobilization and Demobilization

Construction equipment and support items need to be mobilized, or brought, to the site for construction. The ultimate selection of construction equipment would depend upon the availability of equipment to the contractor at the time of construction. In addition to typical generalized construction equipment, potential equipment anticipated for construction of the SELRP includes the following:

- diesel-powered dredge
- electric-powered hydraulic cutterhead suction dredge as an option
- Up to 10,000 feet of steel pipe (e.g., 40-foot-long segments)
- Up to four booster pumps to transfer material to adjacent onshore, nearshore, and offshore stockpile areas (SO-6)

Typically, equipment would arrive by truck and enter the site through designated construction access points. Rock for CBFs and internal lagoon revetments may be brought over on a barge from Catalina Island to an existing dock yard at the Port of Los Angeles or San Diego and then transported south on I-5 via trucks to the project site. Alternatively, rock for the project may be delivered by trucks from quarries located in various locations, including Chula Vista and Corona, approximately 30 and 70 miles from the project site, respectively. Up to 60,000 cy of rock, weighing approximately 120,000 tons, could be required for channel and structure protection throughout the site, depending on the alternative selected.

Dependent upon contractor equipment selection, an electric dredge may be used and facilities for electrical power would be provided in the form of a small temporary on-site electrical substation. If necessary, the temporary electrical power site would be located north of the proposed nesting area and within staging area #5. The electrical power site would connect into existing poles and transmission lines adjacent to railroad tracks and would not require permanent new transmission infrastructure. A temporary pole may be necessary between the existing transmission lines to feed the power site. Electrical equipment would be contained within an enclosed metal structure, approximately 10 by 10 feet and 8 feet high. The small enclosure could be painted or fenced. The electrical equipment and enclosure would be removed at completion of construction.

Equipment mobilization could require up to 6 months due to the need for a dredge and associated materials (e.g., discharge pipe). It is anticipated that the initial 2 months would primarily include setting up a trailer on the site and establishing off-site management requirements. After that date, site and access preparation, dredge assembly, and some clear and grub activities would be initiated. Equipment and materials delivered to the site would be staged at designated areas over the duration of their use. Equipment demobilization would occur when construction is complete, and/or when the use of a particular piece of equipment is no longer needed. Equipment demobilization after project completion is typically relatively short as the contractor removes equipment from the site via designated access routes/points.

Alternative 2A

This alternative requires use of multiple suites of equipment for the various project components of dredging, earthwork, and roadwork. Each is listed below. Mobilization for this project would require approximately 6 months total.

Large-scale dredging equipment would be brought to the site, including a 24- to 26-inch dredge, discharge line (10,000 linear feet), crew boat, temporary dock and launch ramp, crane, front end loader, booster pumps (two to four), discharge barge, tug boat, survey boat, fueling drums, electrical power supply equipment, and a clamshell dredge or long-arm backhoe for rock placement along channels (if needed).

Earthwork would require multiple long-arm backhoes, excavators, large off-road trucks, scrapers, and bulldozers.

Roadwork would require demolition equipment such as a pile driver, crusher operation, pneumatic breaker, dump trucks, bulldozers, motor graders, front end loaders, cranes, concrete and asphalt placement equipment (pavers and rollers), a water truck, and forklifts. Crew size could range from five to 15 workers.

On-site materials disposal would utilize equipment described above for the lagoon enhancement component. Off-site materials disposal for Alternative 2A could include placement onshore, nearshore, and/or offshore at Cardiff and onshore placement at other coastal sites. Equipment required for materials transport and placement includes ocean-based equipment such as a monobuoy, pipeline, booster pumps, a barge, tug boat and work boat. Beach working equipment would also be required, including bulldozers, temporary lighting, and a temporary trailer. At other potential beach placement sites, equipment could include the same items.

Alternative 1B

Alternative 1B also requires use of multiple suites of equipment for the various project components of dredging and earthwork. Each is listed below. Mobilization for this project would require up to 6 months.

Large-scale dredging equipment would be brought to the site, including a 24- to 26-inch dredge, discharge line (10,000 linear feet), crew boat, temporary dock and launch ramp, crane, front end loader, booster pumps (two to four), discharge barge, tug boat, survey boat, fueling drums, electrical power supply equipment, and a clamshell dredge or long-arm backhoe for rock placement along channels (if needed).

Earthwork would require multiple long-arm backhoes, excavators, large off-road trucks, scrapers, and bulldozers.

Roadwork and retrofitting activities would require equipment including cranes with drill attachment, concrete mixer truckers, boom pump trucks, loaders, work trucks, forklifts, 10,000-gallon storage tank, and slurry recirculation pump. Crew size could range from five to 15 workers.

Similar to Alternative 2A, on-site materials disposal would utilize equipment described above for the lagoon enhancement component. Off-site materials disposal for Alternative 1B could include placement onshore, nearshore, and/or offshore at Cardiff and onshore placement at other coastal sites. Equipment required for materials transport and placement includes ocean-based equipment such as a monobuoy, pipeline, booster pumps, a barge, tug boat, and work boat. Beach working equipment would also be required, including bulldozers, temporary lighting, and a temporary trailer. At other potential beach placement sites, equipment could include the same items.

Alternative 1A

This alternative involves a smaller range of construction approaches and therefore requires use of less equipment for project construction. Mobilization for this alternative would require 3 months.

Mid- to small-scale dredging equipment, including a 10- to 24-inch dredge, discharge line (10,000 linear feet), crew boat, temporary dock and launch ramp, crane, front end loader, booster pumps (two minimum and four maximum), discharge barge, tug boat, survey boat, fueling drums, electrical power supply equipment, and a clamshell dredge or long-arm backhoe for rock placement along channels (if needed).

Earthwork would require multiple long-arm backhoes, excavators, large off-road trucks, scrapers, and bulldozers.

The retrofitting of the Coast Highway 101 bridge structure would be the same for Alternative 1A as described for Alternative 1B. Crew size could range from five to 15 workers.

Under Alternative 1A, the majority of material dredged and excavated from the lagoon would be exported offshore to LA-5. Equipment for off-site materials disposal would be focused at Cardiff State Beach and would include ocean- based equipment such as a monobuoy, pipeline, booster pumps, a barge, tug boat, and work boat.

2.10.3 Site Preparation

Site preparation would be initiated during the mobilization period. The project site would be prepared for construction by first surveying and staking the construction area and locations of particular features. Once the project is delineated, "no construction" zones such as sensitive environmental areas would be cordoned off. Specific contractor use areas may also be constructed within identified staging areas, such as laydown pads for staging dredge discharge pipe segments, an electrical power station, and a dredge launch ramp. Installation of a water level control system between the ocean and the lagoon to allow active water level management during dredging activities would also occur, as appropriate. Clear and grub of focused areas of vegetation would also be initiated during site preparation, both onshore and within the lagoon basins.

Alternative 2A

To prepare the site for construction under Alternative 2A–proposed project, the contractor would create a dredge launch ramp north of the westernmost former sewage pond and place a temporary dock, clear a laydown area, prepare a fueling site, bring a trailer on-site, mobilize the dredge discharge line, install a temporary electrical supply site, clear a parking area, and prepare a project office (trailer). A permanent dredge launch site could be installed at this location to provide for inlet and channel maintenance dredging in the future. The permanent ramp would be approximately 30 feet wide and would likely be constructed of dirt covered with a layer of gravel. Additional scour protection would be incorporated, as needed.

Alternative 1B

As with Alternative 2A, the contractor would create a dredge launch ramp north of the westernmost former sewage pond and place a temporary dock, clear a laydown area, prepare a fueling site, bring a trailer on-site, mobilize the dredge discharge line, install a temporary electrical supply site, clear a parking area, and prepare a project office (trailer). A permanent dredge launch site could be constructed at the north end of the utility road under this alternative to provide for channel maintenance dredging in the future. The permanent ramp would be approximately 30 feet wide and would likely be constructed of dirt covered with a layer of gravel. Additional scour protection along the main channel would likely be required to protect the ramp since it is located where flow velocities are relatively high.

Alternative 1A

For Alternative 1A, the contractor would create a dredge launch ramp at the north end of the utility road to provide for both launching the dredge for construction, as well as for channel maintenance dredging into the future. Similar to 1B, the contractor would also perform other mobilization activities such as clear a laydown area, prepare a fueling site, bring a trailer on-site, mobilize the dredge discharge line, clear a parking area, and prepare a project office (trailer) The permanent ramp would be approximately 30 feet wide and would likely be constructed of dirt covered with a layer of gravel. Additional scour protection along the main channel would likely be required to protect the ramp since it is located where flow velocities are relatively high.

2.10.4 WET AND DRY CONSTRUCTION METHODS

Various methods may be employed to construct the project. Construction methods are largely grouped under the two different types: land-based construction “in the dry” and water-based construction “in the wet.” Different constraints are associated with each type of construction, so a combination of approaches is anticipated for the SELRP. Wet construction would require flooding areas that can be diked off to provide adequate water depths to float a dredge over portions of the site proposed for shallow dredging. Dry construction in areas with typically wet conditions is difficult due to extremely soft soils that can limit access for equipment with wheels or tracks; thus, dry construction would typically be restricted to areas around the perimeter of the lagoon that can be reached from shore (e.g., within 50 feet of existing disturbed area), adjacent to existing access roads and dry areas, while wet construction would focus on those areas in sensitive habitats that are not proposed for direct grading and the interior of the lagoon basins. A brief description of each construction approach is provided below.

Wet Construction

Wet, or water-based, construction uses equipment in areas inundated during construction. Water-based construction methods can (1) minimize or eliminate site dewatering, and (2) be more environmentally sensitive because construction of access roads and direct grading/compaction of existing habitat areas in the interior of the lagoon are not required. Site dewatering at a lagoon connected to the ocean experiencing daily tides may not be practical. Also, less intrusion onto vegetated areas is required with a dredge compared to land-based equipment (i.e., trucks, earthmovers), which may result in less site damage. Wet construction approaches have specific limitations as well. Since dredges need to float over the area they are accessing, a minimum amount of water depth must be maintained within portions of the lagoon while dredging is occurring. A typical small dredge has a draft (extends below the water surface) of approximately 5 feet. Therefore, to float a dredge over an area, water depth needs to be maintained at approximately 5.5 to 6 feet. In some areas where ultimate depths would exceed 5 feet below grade, normal tidal fluctuations may maintain adequate depth to allow the dredge to work. In areas where ultimate depths would be in less than 5 feet of water, additional water would need to be temporarily impounded in the lagoon to maintain adequate depths for the dredge to work. To achieve sufficient water depth within the lagoon, flooding would occur in specific areas to allow the dredge to make shallow (less than 5-foot) cuts in the lagoon bottom, up to +6 feet NGVD.

Specific constraints would be implemented during wet construction for all alternatives to minimize impacts to sensitive wildlife (e.g., birds). Construction of temporary dikes to create refugia for wildlife during inundation would occur prior to flooding in the central basin to protect habitat throughout construction from both direct impacts associated with grading and/or dredging and indirect impacts due to extended inundation. Flooding in areas designated for inundation as shown in Figures 2-16 and 2-17 would be initiated prior to the breeding season and maintained. Once flooding is allowed to recede, flooding would not be reinitiated in the breeding season. Any area serving as refugia would also be reintroduced to tidal action outside of the breeding season. Additional general project design features have been incorporated into each of the project alternatives that would minimize effects to other resources, such as water quality, as appropriate. The specific measures described above and these more general measures are identified in Table 2-25 at the end of this section.

Wet construction in lagoons typically relies on dredging equipment, such as hydraulic cutterhead suction dredges, long-arm backhoes mounted on barges, drag-lines, clamshell bucket dredges, and barge-mounted fluidizer pumps. It is anticipated that one or more cutterhead section dredges would be used to construct the SELRP, although specific equipment would be determined by the contractor.

Alternative 2A

Flooding under Alternative 2A–proposed project would be required during dredging of the proposed secondary channels as well as low-marsh and mudflat areas in the central basin, east basin, and west basin. Basins could generally be flooded separately to limit concurrent flooding of sensitive species habitats. Flooding in the central basin and west portion of the east basin could last up to 3 months during Phase 1, and 7 months during Phase 2. Flooding of the east basin would also last up to 7 months during Phase 3, and flooding of the west basin would be less than 4.5 months in Phase 4. Dikes would be constructed in multiple locations to limit flooded areas in the central basin and provide wildlife refugia. Flooding in the east basin would be initially limited by the existing CDFW dike that would be left in place until completion of Phase 3, then a dike would likely be placed at the I-5 bridge crossing during Phase 3 east basin dredging.

Wet sandy material from the overdredge pit created in the central basin would primarily be discharged off-site at an approved placement site, while wet silty/clayey material from the remainder of the site would be generally disposed of on-site in the overdredge pit that would be constructed in the central basin. A small amount of sand would be reused at the proposed nesting site in the central basin, and a small quantity of silts/clays could be reused on-site for construction of man-made transitional areas. Some material could also be used for aggregate during Coast Highway 101 bridge and roadway construction.

Alternative 1B

Flooding under Alternative 1B would also be required during dredging of the proposed secondary channels as well as the low-marsh and mudflat areas in the central basin, east basin, and west basin. The basins would be diked off and flooded separately to limit concurrent flooding of sensitive species habitats, similar to Alternative 2A. Flooding in the central basin and west portion of the east basin could last up to 3 months in Phase 1, and 7 months during Phase 2.

Flooding of the east basin could also last up to 7 months during Phase 3, and flooding of the west basin would be less than 4.5 months in Phase 4. Dikes would be constructed to limit flooded areas in the central basin, while flooding in the east basin would initially be limited by the existing CDFW dike that would be left in place until after Phase 3 is complete. A dike would then be placed at the I-5 bridge crossing during Phase 3 east basin dredging.

Wet sandy material from the overdredge pit created in the central basin would primarily be discharged off-site at an approved placement site, while wet silty/clayey material from the remainder of the site would be generally disposed of on-site in the overdredge pit. A small amount of sand would be reused at the proposed nesting site in the central basin, and a small quantity of silts/clays could be reused on-site for construction of man-made transitional areas.

Alternative 1A

Flooding would not be required under Alternative 1A, which would focus dredging activity in channels within the lagoon that generally exceed 5 feet in depth and do not require additional water to dredge those areas.

As discussed in Section 2.9, Alternative 1A would not provide material of suitable quality for reuse within the littoral zone. As a result, material dredged as part of that alternative would be used either on-site (e.g., 10,000 cy at man-made transitional areas, 35,000 cy of sand at the nesting site) or would be disposed of at LA-5.

Dry Construction

Dry, or land-based construction within lagoons typically uses earthmoving equipment accessing a site from the beach, shore, or access roads into the site. For all alternatives, the SELRP envisions only a modest amount of dry construction compared to wet construction. Due to the sensitive habitat within San Elijo Lagoon and the extremely soft soils, construction of access roads for dry construction would be restricted to the shoreline in the vicinity of existing roads (i.e., utility roads in the central and east basins) or areas proposed for grading. Dry construction would likely include clearing tules and other emergent aquatic vegetative growth along the edges of the central and east basins to prepare the site for dredging, and excavation under Coast Highway 101 for the proposed tidal inlet.

2.10.5 Site Access and Staging Areas

Site Access

The access points for each alternative, illustrated in Figure 2-15, are generally sited at existing access points and existing disturbed areas. According to basin, the general anticipated access points include:

- west basin – off Coast Highway 101, both north and southbound lanes
- central basin – from the north end of North Rios Avenue in Solana Beach to the on-site utility road at the south side of the lagoon, and from Manchester Avenue at the north side of the lagoon
- east basin – from the north end of Santa Ynez Street in Solana Beach to the on-site utility road at the south side of the lagoon, and from Manchester Avenue at the north side of the lagoon

Larger pieces of equipment, such as dredges, may be transported to the site on trucks during the late evening to early morning hours (between 9 p.m. and 6 a.m.) to minimize potential traffic disruption. The inlet and Coast Highway 101 bridge construction equipment and materials are anticipated to arrive via I-5 to Coast Highway 101.

The access road from North Rios Avenue in Solana Beach to the central basin utility road would require some vegetation clearing, grading, and fill with earth and gravel to widen the road to accommodate construction and maintenance vehicles and equipment. Road improvements would occur on both sides of the hillside access road, resulting in less than 5,000 cy of earth moved. Improvements may also occur lower along the access road and may require up to an estimated 10,000 cy of gravel. The road would require periodic maintenance and dust control by the contractor throughout construction, and would retain improvements after construction.

A permanent access and staging pad is proposed along Manchester Avenue in the central basin. This site would be constructed by importing 5,000 cy of earth from off-site and would be used for construction purposes and for permanent access and maintenance.

Temporary staging and stockpile areas would be returned to pre-construction conditions after the completion of construction. Photographs of the site would be taken and wetland vegetation would be mapped prior to construction. Permanent access and staging areas would remain in place after construction to allow for periodic maintenance and adaptive management activities.

During construction, protection of existing utilities and public safety would occur. A pre-construction survey, mapping of utility lines, mobilization of land-based equipment, and construction of access routes and staging areas for the project would be completed under each of the alternatives. Public safety protection measures would be incorporated, including the use of barriers, signs, flagmen, and fences where applicable. Temporary lighting may also be required during nighttime activities such as dredging and materials delivery. Lighting would be downshielded to minimize light spillover into adjacent habitat and residential areas. These measures are identified in Table 2-25 and would be implemented throughout the construction period, as appropriate, to protect public safety within the lagoon and materials placement/disposal sites.

Specific site information is provided in Table 2-24. This table also provides information on which alternatives are anticipated to require use of each of the different sites. Alternative 2A would utilize all of the proposed access points shown in Figure 2-15, while Alternative 1B would utilize all sites except site 4, and Alternative 1A would not use sites 6, 4, or 2.

Alternative 2A would also require removal and relocation of one pole supporting overhead power lines located directly east of the existing railroad track. Alternative 1B and Alternative 1A would not require the removal of utility poles.

Table 2-24
Staging Areas

Staging Area ID No.	Description	2A–Proposed Project	1B	1A
West Basin - Accessed from Coast Highway 101				
1	This beach staging area is required to stockpile and distribute construction materials onto Cardiff State Beach for all alternatives. Disposing of materials to the nearshore zone via hydraulic dredge would require electric power at this location for a temporary booster station needed for conveying the slurry material between the lagoon and the ocean. This staging area would also provide access for a backhoe or a bucket and a crane to mechanically excavate the inlet channel to the desired contours. Dredge discharge pipe may also be staged at this location, as well as quarry stone for the cobble blocking features (CBFs) and internal revetments. All alternatives would station a booster pump at this site for the entire duration of dredging sand from the lagoon to the ocean. • Alternative 2A would use the site to store dredge pipe before and after dredging, for a period of approximately 2 months total. Earthmoving equipment would also be staged on this site intermittently over the project construction period. Rock for CBF materials would be staged on this site for approximately 2 months. • Alternative 1B would use the site to store dredge pipe before and after dredging, for a period of approximately 2 months total.	X	X	X

Staging Area ID No.	Description	2A–Proposed Project	1B	1A
	Earthmoving equipment would also be staged on this site intermittently over the project construction period. Rock for revetment materials would be staged on this site for approximately 2 months. • Alternative 1A would use the site to store dredge pipe before and after dredging, for a period of approximately 1 month. Rock for revetment materials would be staged on this site for approximately 2 months.			
2	This tidal inlet staging area (Alternative 2A and Alternative 1B) is also suitable for the same equipment and materials to be staged at site 1. This site could also serve as the transition point for an onshore pipeline discharging material to extend offshore to a discharge pipe or monobuoy.	X	X	
3	The existing tidal inlet channel staging area is suitable for quarry stone for the CBFs and internal revetments.	X	X	X
4	The sedimentation basin staging area (Alternative 2A only) is also suitable for the same equipment and materials to be staged at sites 1 and 2.	X		
Central Basin – Accessed from North Rios Avenue and from Manchester Avenue				
5	The former sewage ponds staging area is suitable for the same equipment and materials to be staged at sites 1 and 2. This staging area may be the best location to assemble the dredge due to its relatively large footprint. A small power panel and a dredge launch site would be constructed at the north end of the westernmost former pond. This would facilitate use of an electric dredge and a launch ramp for dredges to construct and maintain the lagoon in the future. This staging area would provide access for assembling and launching dredges from trucked-in components, and would include a yard fuel supply, parking area, office, dock (or platform to tie up the dredge and/or crew boat), and an access dock with a shore-based crane. Temporary power and water would be provided at this location by accessing existing infrastructure located along the access road. Water could be delivered by truck if there is not a water line already in the vicinity. Overhead power exists near the city sewer pump station and would potentially be tapped into for this project.	X	X	X
6	The existing southern access/overlook point (6) would eventually be filled and raised with lagoon material to create a transitional habitat area and, therefore, would be highly disturbed. As such, during construction this site can be leveled and used to stage various types of equipment and materials.	X	X	
7	The site along Manchester Avenue is directly across from the onramp to Interstate 5 south and is suitable for access and staging for clearing and grubbing, and for various pieces of equipment and materials.	X	X	X
East Basin – Accessed from Santa Ynez Street and Manchester Avenue:				
8	The existing utility access road would be available for staging certain equipment and materials that can fit onto the narrow and long surface.	X	X	X
9	The existing dike would be used for staging certain equipment and materials that can also fit onto the narrow and long surface.	X	X	X
10	The existing frontage road near Mira Costa College would be used for staging equipment and materials that can be transported to the lagoon as needed.	X	X	X

Staging Areas and Parking

Potential staging areas for construction access to the project site and storage of equipment and materials are shown in Figure 2-15, and Table 2-24 indicates which sites would be used for each alternative. Each site is identified in the figure by number, corresponding to the discussion in Table 2-24. It is anticipated that construction of the project would require a minimum of two staging areas to serve each lagoon basin, as shown, with the possibility of optional areas depending upon the alternative grading/dredge plans selected for construction.

Daily traffic would consist of personal vehicles owned by construction and construction management personnel, various inspectors, and other representatives from the various agencies and property owners involved with the project (a maximum of 20–40 people per day). Potential parking areas have been identified, including:

- San Elijo State Beach parking lot
- Coast Highway 101 south of the Chart House
- Old sewage basin staging area (within the lagoon)
- Frontage road by Mira Costa College
- Via Pico
- Farin property along Manchester Avenue
- I-5 off-ramp lot
- I-5 and LOSSAN shared right-of-way (ROW) areas
- Cardiff State Beach parking lot

It is anticipated that workers may park at various approved parking areas and then be shuttled to their positions on-site. The contractor would obtain permission or authorization as necessary.

The contractor would contact the appropriate local agency to obtain water and power supplies. Power would be supplied by temporary tie-ins to the existing SDG&E lines and uses would range from power for the construction trailer to power for the dredge. Water would be supplied via temporary connections from the closest water district to each laydown area, which could include the Olivenhain Municipal Water District or San Dieguito Water District.

2.10.6 Clear and Grub of Vegetation

Prior to dredging and grading, specific areas would be cleared of vegetation and the uppermost soil layer in a process called clear and grub. Clear and grub activities would generally occur at areas to be excavated and graded using earthmoving equipment, where accessible. This material would be exported from the site using trucks hauling it along access roads to disposal sites such as the Miramar Landfill. Clearing of vegetation may also be needed at open water areas proposed for dredging that are filled with high-profile emergent aquatic vegetative growth. This material may be cleared using a backhoe mounted on a barge that removes the material and places it into a second barge. The second barge would transport the material to the shore, then would travel back to the clear and grub site. Vegetation removed would be offloaded along the shore and then hauled to a disposal area off-site. Site 7 along Manchester Avenue west of I-5 would be used for off-loading vegetation removed from the lagoon. Some material may require drying at stockpile sites (staging areas) prior to being hauled off-site. Approximately 365,000 cy of material is anticipated to be removed from the site during clear and grub activities, with 85,000 cy removed from the central basin (60,000 cy from the channel areas and 25,000 cy from the overdredge pit), 270,000 cy from the east basin (240,000 cy from the area west of the existing CDFW dike, and 30,000 cy from the area east of the dike), and 10,000 cy from the west basin. While the majority of vegetation and soil material removed during this clearing process is anticipated to be trucked off-site to a landfill, limited stockpiling of topsoil may occur to cap graded areas proposed to be restored with wetland habitats. In addition, mulching of some "green waste" may occur to allow on-site reuse as appropriate and to reduce off-site hauling. Any clear and grub of sensitive habitat would be restricted to outside the bird breeding season, as identified in Table 2-25.

2.10.7 Transitional Areas/On-site Fill

Each of the project alternatives proposes the use of dredge material on-site for the construction of man-made transitional areas and as fill (e.g., nesting area). Transitional areas would be constructed in various locations within the lagoon basins to augment the existing band of habitat surrounding the lagoon and provide additional refugia to species under future sea level rise. Material for creating transitional areas would be pumped into the east side of the former sewage pond (e.g., proposed nesting area) to dewater. Material would be drained, dried, and stockpiled for subsequent use. The capacity of the former sewage pond at any one time is approximately 30,000 cy of material. In addition, a portion of this material may be used temporarily to create the dikes used for the refugia areas.

<u>Alternative 2A</u>

The capacity of the former sewage pond is sufficient to provide material for Coast Highway 101 (approximately 10,000 cy) and more than half of the volume for the proposed transitional habitat areas (total needed quantity is 35,000 cy in the central basin). This material would be provided during Phase 1 or 2 dredging. The remaining 10,000 cy volume needed for the transitional areas would be provided by a second period of dewatering during Phase 2 or 3 dredging.

Transitional habitat areas would be constructed by either hauling or barging material (depending on their location) from the dewatering site. Two of the three transitional areas to be constructed are located adjacent to the access/utility road extending from the north end of North Rios Avenue down into the lagoon from the south. These two sites, one located along the south edge of the central basin, and one in the northwest portion of the central basin, can be accessed by truck or barge. For work within the northern part of the central basin, work would be timed to be done prior to creation of the subtidal area connecting the central and west basins under the rail line, because the utility road would be eliminated at that stage of construction. Finish grading may be done at this site using bulldozers. The third transitional area is located in the southern portion of the central basin but is surrounded by habitat, and would be accessed by water using a barge and crane to place material in the central basin.

Alternative 1B

As described for Alternative 2A, wet material would be dewatered and staged at the former eastern sewage pond site. This site would stage fill for the transitional areas in two phases, as described above. Construction of transitional areas would be similar to Alternative 2A, as described above. Transitional areas under Alternative 1B could be filled at any time during construction, however, since the utility road would remain through completion of the project.

Alternative 1A

Alternative 1A would involve much less material dewatering and rehandling due to its limited extent of change to the existing lagoon. Only 10,000 cy of material would need to be dewatered and hauled to the proposed transitional area in the northwest portion of the central basin. Only a single dewatering phase is needed, and conveyance could occur by truck along the utility road.

2.10.8 NESTING AREA

After utilizing the former sewage pond as a dewatering basin for dredged material, it would be finished as a nesting area for sensitive birds under each of the alternatives. Sand would be used to fill the eastern half of the former sewage pond up to an elevation of +13 feet NGVD to create the 2-acre nesting site. Material would be allowed to drain and dry sufficiently for earthmoving to occur using bulldozers to sculpt the site to the appropriate template for use by birds. This site would take up to 35,000 cy of sand to reach its final grade.

Alternative 2A

To build the nest site, sand would be dredged from the west basin and either pumped in from the dredge or hauled over external roads by truck to the site from Solana Beach.

Alternative 1B

At the end of dredging for restoration, sand would be dredged from the tidal inlet channel and pumped into the nest site for its creation.

Alternative 1A

Sand dredged from the tidal inlet channel would be either pumped to the nest site or driven by truck to the site and placed.

2.10.9 Channel and Bridge Structure Armoring

Each of the alternatives would increase channel cross sections under existing and/or proposed bridge structures. These structures, as well as adjacent channel banks, would require protection using riprap and/or articulated block mats. Access areas for periodic maintenance into the future would also require protection, depending on their location in the lagoon (e.g., permanent dredge launch ramp and access sites along Manchester Avenue).

Riprap would "wrap" around the base of each abutment and extend at least 100 feet upstream and downstream from each abutment. Some reaches near bridges have existing riprap that would be left in place and integrated into new riprap to provide a continuous reach of shore protection under each bridge. The riprap stone would be approximately 1- to 2-ton stone approximately 3 feet in diameter. Riprap exposed to the ocean would need to be larger, approximately 4 feet in diameter, due to larger forces in the ocean. Riprap would be brought to the site by truck and lifted into place using a crane with a long reach. It is anticipated that riprap would be stockpiled at various sites around the lagoon, including sites 1 and 3.

Alternative 2A

Existing structures to remain in place under Alternative 2A include the existing railroad crossing, although an additional railroad bridge would be constructed by others farther south to span the new inlet location. Other existing infrastructure proposed to be replaced/modified by others (I-5 and railroad) would incorporate appropriate protection into design. The SELRP would construct a Coast Highway 101 bridge structure farther south than the existing crossing to span the new proposed inlet location. This structure would incorporate appropriate scour protection into design as well. The existing railroad crossing would not require additional riprap protection. The permanent dredge launch ramp proposed just north of the nesting area and permanent sites identified for periodic future maintenance access would also require protection. Approximately 60,000 cy of riprap or other protection would be required under Alternative 2A.

Alternative 1B

Alternative 1B would retain the existing lagoon inlet location, and the channel extending between Coast Highway 101 and the railroad bridge would require protection. This measure is to protect the channel from erosion due to higher tidal flow velocities caused by the increased tidal prism. Armor stone would be stockpiled and used by the contractor to armor the existing tidal inlet channel during construction. Riprap armor stone would be placed along the west sides of the existing tidal inlet channel from Coast Highway 101 (existing protection along the east side would remain in place). The existing railroad crossing and proposed dredge launch ramp would also require additional riprap protection along the main channel. Permanent sites identified for periodic future maintenance access would also be protected. In addition, protection for the two proposed footbridges and foot path in the northwest portion of the central basin would be required. Alternative 1B would require approximately 60,000 cy of riprap.

Alternative 1A

Alternative 1A would retain the existing lagoon inlet, and the channel extending between Coast Highway 101 and the railroad bridge would require protection similar to Alternative 1B. The existing railroad crossing and proposed dredge launch ramp would also require additional riprap protection along the main channel. Permanent sites identified for periodic future maintenance access would also be protected. Overall, approximately 60,000 cy of riprap would be required for Alternative 1A.

2.10.10 Coast Highway 101 Bridge Construction or Retrofit

Alternative 2A

Under Alternative 2A, a new Coast Highway 101 bridge would be constructed over the new inlet as described below.

Coast Highway 101 Construction Activities and Schedule

Construction on Coast Highway 101 associated with Alternative 2A would be initiated in Phase 1 and would last approximately 18 months. The Coast Highway 101 bridge construction detour and bridgework would occur concurrently with dredging of the central basin during Phase 1, including placement of bank protection around new bridge abutments and the fill supporting the new highway alignment and bed scour protection under the proposed bridge (all likely to consist of rock revetment material). Figure 2-5 illustrates the proposed construction approach for the new bridge structure. Work on the west and east halves of the roadway would be conducted sequentially. After the temporary detour is constructed, demolition and pile installation would commence on the other half of the existing Coast Highway 101. The remaining half of the new bridge would be constructed, followed by a final joint pour between the two deck structures.

The new bridge would be built sufficiently high to provide for the appropriate elevation to clear all high water combinations. Adjacent stretches of the highway would be raised substantially to meet the bridge vertically as it approaches, as shown in Figure 2-5. The highway approaches to the new bridge would be up to 8 feet (+10.5 feet to +18.0 feet NGVD) or 6 feet (+16.0 feet to +22.0 feet NGVD) higher than the existing highway north and south of the proposed Coast Highway 101 bridge, respectively. Approximately 10,000 cy of fill would be required to build the bridge approaches.

Access between the staging area (site 5 in Figure 2-15) and Coast Highway 101 would occur via a haul road extending between the dredge launch site (near the former sewage pond) through the proposed subtidal basin footprint and under a new LOSSAN railroad bridge location to Coast Highway 101. This assumes that the LOSSAN railroad double-tracking project would occur concurrently, as has been indicated by SANDAG in project coordination meetings. The haul road would pass under the new proposed rail bridge and through the west basin to Coast Highway 101. The southern portion of the west basin may need to be closed to the tide at this point (at low tide, leaving the basin relatively dry and still providing refugia for species during flooding in other basins). A dike could be constructed toward the south end of the basin, or the haul road itself could serve as a dike preventing water flow to the southern end of the basin (dike 7 in Figure 2-15). Close coordination with the rail bridge contractor would be required throughout this phase of the project. The portion of the existing Coast Highway 101 roadway within the bridge construction area not open to travel would be demolished and pavement processed into aggregate and reused for road base and asphalt. Remaining construction of the Coast Highway 101 bridge and bridge approaches would occur in Phases 2 and 3. Construction of the new Coast Highway 101 bridge structure would be completed before opening the new tidal inlet, and work would be completed using dry construction techniques. The existing Coast Highway 101 bridge would remain.

Traffic Modifications during Coast Highway 101 Construction Activities

All traffic would be detoured onto a temporary surface of the road on one-half (two lanes) of the existing Coast Highway 101 bridge. One side of the new bridge would be constructed and poured first, while traffic would use the other half of existing Coast Highway 101 to maintain continual access in both directions. Once one side of the new bridge is completed, traffic would then be shifted to the side of Coast Highway 101 with the new bridge while the remaining half of the new bridge would be constructed.

Alternative 1B

Under Alternative 1B, the existing Coast Highway 101 bridge would be retrofitted to increase its seismic stability.

Coast Highway 101 Retrofit Activities and Schedule

Retrofitting of the existing bridge along Coast Highway 101 would be implemented by others and would last approximately 8 months. This work could occur at any point during the restoration project construction period prior to clearing of the tidal inlet channel (anticipated to be a Phase 4 action), so the contractor may choose to delay initiating work along the roadway to another phase. The work would necessitate managing the tidal inlet location to allow retrofit work to be done in dry conditions. Retrofit work would likely be phased and would be completed under one-half of the existing bridge length (e.g., either the south or north end) while the tidal inlet channel is maintained in position under the other half of the existing bridge. When first phase work is complete, the tidal inlet channel would be moved under the other half of the existing bridge (with the completed retrofit) and the second phase of retrofit work would be completed. Construction would begin with mobilization of equipment and materials, followed by construction of CIDH piles, construction of pile caps, and construction of pier walls. Anticipated retrofit work is described below.

A large-diameter concrete shaft (CIDH pile) would be constructed at the ends of each bridge pier and connected to the existing bridge with a concrete grade beam or pile cap. Existing piles not yet been encased in shotcrete would be encased. New shafts would be designed for seismic loads and embedded into competent material by drilling below the loose surficial soils, which are susceptible to liquefaction. The CIDH piles are anticipated to be approximately 5 feet in diameter and 100 feet deep. If existing piles were to fail through shear, or to lose vertical capacity through liquefaction of the soil, the new piles would support the dead load of the bridge and prevent the bridge from collapsing. The above repairs would correct the existing seismic deficiencies of the structure. It is anticipated the work would be done using dry construction approaches with equipment such as cranes and loaders.

Traffic Modifications During Coast Highway 101 Retrofit Activities

It is anticipated that the CIDH piles would be constructed using a 100-ton crane positioned on the existing bridge deck. This would necessitate closing half the bridge to traffic 24 hours per day for approximately 3 months and traffic detours would be required. For instance, the easterly two lanes would be closed as the CIDH piles on that side were installed, and the two westerly lanes would stay open to two-way traffic. Once the easterly piles were installed, traffic would be moved to the easterly lanes and the operation would move to the westerly side of the bridge. It is anticipated some additional complete night closures and detour of traffic would occur for the installation of the rebar cage for the piles. Remaining work would be accomplished from under the bridge.

Alternative 1A

Under Alternative 1A, the existing Coast Highway 101 bridge would be retrofitted to increase its seismic stability, similar to the description for Alternative 1B.

2.10.11 OPENING THE TIDAL INLET

Under all alternatives, the existing or new inlet would be addressed as one of the final construction activities. Various methods can be used to open a new inlet, or to expand and enlarge the existing inlet. The method proposed for each individual alternative is described below.

Alternative 2A

The new inlet associated with Alternative 2A would be excavated and opened "in the dry." A typical approach is to erect and maintain a dike separating the inlet from the sea, and work behind the dike with earthmoving equipment to excavate the channel and install bed and bank protection (stone). Once components are installed, the dike at the beach is breached with a backhoe from shore at low tide and the site is allowed to flood on the next incoming tide.

Alternative 1B

The existing inlet would be expanded and enlarged using the same approach that the SELC presently uses to maintain the inlet. This approach is to dike off the inlet and install a temporary construction road between the internal inlet channel and the beach and a working platform along the internal inlet channel. A backhoe sits on the working platform and excavates sand from the channel and drops it into trucks that carry it to the beach for dumping. The working platform is progressively moved along the length of the inlet channel to enable clearing of the entire channel length.

Alternative 1A

Opening the tidal inlet would be identical to the description provided for Alternative 1B.

2.10.12 Inlet, Basin, and Channel Maintenance Activities

Maintenance activities would require future access for equipment and personnel to areas also delineated in Figures 2-12 through 2-14. Intermittent access, maintenance, and staging areas include needed launch facilities for dredge equipment, staging for equipment, and roadways to access these areas. Some additional maintenance in channels may occur very infrequently (every 10 years) and in focused locations subject to sedimentation, vegetation encroachment, or other adaptive management needs.

Alternative 2A

Maintenance of the sediment basin and inlet would be conducted by dredging. A 10- to 24-inch dredge would be mobilized from the proposed permanent dredge launch ramp near the nesting site, and moved throughout the sedimentation basin to remove sand. Approximately 300,000 cy is anticipated to be dredged from the basin approximately every 3 years, and the material placed on Cardiff Beach south of the tidal inlet. Placement would occur by allowing sand to flow out of the end of the discharge pipe above the mean high tide line (+2 feet NGVD) and below the elevation of the beach berm (+12 feet NGVD). Sand would be conveyed to the beach while waves and tides rework and disperse it, thereby "feeding" the littoral cell. This approach is similar to that employed at Batiquitos Lagoon in 2011 and Bolsa Chica in 2009. Conveyance would occur using a 10- to 24-inch-diameter high-density polyethylene (HDPE) pipe from the dredge to the beach. A temporary electrical power site similar to that discussed for construction may be placed on-site during maintenance activities; no booster pumps would be required. The work may require up to 5 months for completion.

Additional channel maintenance may be required in some of the main and secondary channels, depending on sedimentation and vegetation growth. This type of activity is anticipated to be required approximately every 10 years. For channel maintenance, it is anticipated that a smaller dredge or barge would utilize the dredge launch ramp to access channels through the sedimentation basin, and then remove sediment or vegetation from focused areas. Depending on the quality of sediment removed, it may be placed on Cardiff Beach (in a process similar to that described above) or dewatered and transported off-site to a landfill. Similarly, vegetation removed during channel maintenance would be disposed of off-site. Material identified for off-site disposal would be transported to shore access locations along Manchester Avenue (for the west, central and east basins) and trucked to I-5 and the designated disposal site. For these activities, a temporary electrical power site similar to that discussed for construction may also be placed on-site.

Alternative 1B

Alternative 1B would require inlet maintenance using the same approach as existing conditions. That approach uses earthmoving equipment to clear the existing tidal inlet channel from Coast Highway 101 to approximately the location of Kai's Restaurant, near the location of the first channel bend (west of the railroad line). The contractor would use off-road rear dump trunks, a bulldozer, and a large backhoe to complete the work. As explained above, the contractor would dike off the inlet channel under Coast Highway 101 with a bulldozer to prevent tidal inundation during the channel excavation, and dig a low road under the existing bridge for trucks to drive beneath (the height of the trucks is sufficient to warrant lowering the sand surface under the bridge to provide sufficient clearance). The bulldozer would also be used to build the following:

- a temporary haul road within the inlet channel along Coast Highway 101 that trucks can use to access the backhoe; and
- a sand pad working platform for the backhoe in the channel along Coast Highway 101 that sits above the tide.

The backhoe would work from the pad to dig sand from the channel. The backhoe operator would swivel the backhoe toward Coast Highway 101 and place several bucketfuls of sand in the rear of a dump truck. The truck would then drive north and under the Coast Highway 101 bridge to the beach, south of the restaurants, and place the material on the beach. The truck would then drive back to the inlet channel for another load. This cycle would be repeated with several trucks (approximately three) in a queue. The working pad for the backhoe would progressively move upstream in the inlet channel as the excavation proceeds until it reached its most upstream point. The bulldozer would continually maintain the sand berm across the inlet, the road under the Coast Highway 101 bridge, and the backhoe's working pad during the operation. Approximately 40,000 cy is anticipated to be removed during each annual inlet maintenance cycle, which would require approximately 4 weeks to complete.

Additional channel maintenance may be required in some of the main and secondary channels, depending on sedimentation and vegetation growth, in a manner similar to that described for Alternative 2A. A temporary electrical power site similar to that discussed for construction may be placed on-site during maintenance dredging activities.

Alternative 1A

Alternative 1A would require maintenance of the inlet, similar to Alternative 1B. It is anticipated that less material would be excavated with each maintenance cycle. Under Alternative 1A, approximately 35,000 cy is anticipated to be removed during each annual inlet maintenance cycle, which would require approximately 3 weeks to complete.

Additional channel maintenance may also be required in the main channel under Alternative 1A, depending on sedimentation and vegetation growth, in a manner similar to that described for Alternative 2A.

2.10.13 Revegetation and Restoration of Habitat

After dredging and filling is complete within each basin of the lagoon, recovery of disturbed areas would begin. It is anticipated that, to attain the post-restoration habitat distribution shown in Figures 2-3, 2-9, and 2-10, a combination of natural recruitment and targeted planting would occur. Some wetland habitats are relatively easy to establish through natural recruitment if areas are created at specific elevations and inundation frequencies (e.g., pickleweed/mid-marsh). Other habitat types, such as low marsh and transitional habitats, do not establish as quickly, and may need to be supplemented with focused planting efforts. Post-restoration habitat distributions are shown in Table 2-17.

A comprehensive restoration plan would be prepared for San Elijo Lagoon once an alternative has been selected. The restoration plan would include plant and soil salvage plans, planting plans, natural recruitment expectations for wetland habitats, measures to promote sensitive species recruitment (wildlife and plant species), quantitative and qualitative success standards, remedial measures, and annual monitoring requirements. Monitoring is expected to include sediment and water quality sampling, as well as a range of biological analysis (e.g., algal, invertebrate, avian, and aquatic species surveys). The restoration plan would be implemented for a minimium of 5 years or until success criteria are met. Following the 5-year construction maintenance period, long-term adaptive management of the lagoon would continue. More details on the long-term and adaptive management of the lagoon are discussed in Section 2.11.3, below.

Target habitat communities and land cover types are noted below for each alternative. Detailed performance criteria would depend on the alternative selected and be both qualitative and quantitiative. Regardless of the alternative chosen, performance criterion would be established for improved water quality, hydrologic function, and biological resources to ensure that restoration improvements can be measured and triggers for remedial measures and adaptive management are clear.

2.10.14 Materials Disposal for Construction Activities

Construction Schedule and Phasing

Materials disposal of sediment removed from the lagoon is a critical component of the proposed project but would occur during focused periods of the overall lagoon restoration. Vegetation removed from the lagoon through clear and grub activities would also be required, as described in Section 2.10.6. This section focuses on the export and disposal or reuse of sediments, which can be complex depending on the quality of the material. A SAP has been prepared for the project to characterize sediment within the lagoon, and provides a preliminary conclusion that sediment within the overdredge pit location is suitable for placement on beaches or in the nearshore, or in offshore stockpile sites (Appendix A). Additional characterization will be required once an alternative has been selected for implementation. Depending on the quality of materials to be exported, a number of different disposal and/or reuse scenarios exist. Each of these could involve different methods. For Alternative 2A–proposed project and Alternative 1B, material would be reused on-site, placed within the littoral zone, or deposited at SO-5/SO-6. Alternative 1A would not produce suitable material for reuse, and material would be disposed of on-site in transition areas or offshore at LA-5. Depending on the locations and methodologies for disposal/reuse, different construction methods could result in varying durations/timing of disposal.

Under Alternative 2A and Alternative 1B, 13 months is required for Phase 1, 7 months each is required for Phases 2 and 3, and 4.5 months is required for Phase 4, to dredge and transport material to offshore areas, the nearshore, nearby beaches, or adjacent construction sites. Some additional constraints on material transport and placement may be imposed during the permitting phase, such as seasonal or special event restrictions for specific area beaches.

For Alternative 1A, disposal could occur over the construction period of up to 9 months and no schedule restrictions are anticipated on disposal activities. These activities would occur as material is excavated from the top layers of sediment in each lagoon basin.

Export and Sediment Transport Operations

If sediment is being discharged outside of the lagoon (e.g., not in transitional or nesting areas), transporting dredged materials to the ocean is necessary. Transport is anticipated to occur through a pipeline extended from the lagoon, through the lagoon inlet, and directly to the placement site (for placement at portions of SO-6, Cardiff nearshore, and Cardiff Beach) or into a waiting barge (for transport of material to SO-5, portions of SO-6, nearby beaches, or LA-5). An offshore mooring would be located at a temporary monobuoy offshore from site 4 (see Figure 2-15) to provide a relatively stable hook-up location for a barge. Once full, the barge would transport materials to offshore disposal sites (LA-5), designated placement sites outside the littoral zone (SO-6 or SO-5), or beaches located up or down the coast. Disposal/placement once the sand has been transported to the site is described below depending on placement approach.

Up to four booster pumps may be necessary to help convey material to the disposal locations through the dredge pipeline. The booster pumps ensure that the dredged material flows through the pipelines with enough speed and energy so that heavier material does not settle out and clog the pipeline. The booster pumps would be temporary and installed at locations along the dredge pipeline. The booster pumps are generally a large engine with the dredge pipeline entering and exiting from each end. Each booster pump is self-contained, typically on top of temporary skids on a wood or metal floor pad. Because the booster pumps are temporary, they do not require a permanent foundation or pad; rather the pumps can be placed on level areas of gravel or dirt, on the beach, or other stable surfaces. If located outside of the secured construction area, such as on the beach, the booster pump equipment would be fenced for security purposes. The booster pumps must be maintained and are typically visited a couple of times per day.

Offshore Placement

Both the SO-5 and SO-6 borrow sites dredged for the 2001 RBSP or 2012 RBSP remain as depressions approximately 10 to 15 feet below the adjacent seabed. Materials placement could occur within these sites as part of the SELRP for offshore stockpiling of material suitable for reuse within the littoral zone. The 2012 SO-6 dredge area is close enough to shore (within 4,000 feet) for sand to be discharged directly through a pipeline extended along the ocean floor from the beach off of the proposed location of the new inlet for Alternative 2A. The discharge line would pass from the lagoon through the existing tidal inlet and along the back of the beach to south of the restaurants, then straight offshore into the placement site. Natural ocean forces would distribute material within the placement site depression. The untended seaward end of the pipe could potentially remain in place. Sand would deposit around and over the pipe in a centralized area. The pipe would be pulled out of the site from its landward end by earthmoving equipment at project completion. Alternatively, sand would be pumped from the lagoon through a discharge line to a barge over the discharge site with a downspout, then directed downward into the placement site. Material would exit the barge-mounted downspout near the seabed and settle on the seafloor within the placement site. The barge would be repositioned periodically to spread the discharge evenly through the placement site, and natural forces would complete the distribution.

Nearshore Placement

As part of construction, nearshore placement of beach-quality material would occur off Cardiff State Beach, just outside of the surf zone. As part of Alternative 2A–proposed project, this placement would be a critical component of providing a stable, prefilled ebb bar adjacent to the relocated inlet. A prefilled ebb bar would provide the material needed for the ultimate equilibrium geomorphic formation and thereby minimize beach erosion in the area (M&N 2011). Nearshore placement under Alternative 1B could also occur to supplement the local littoral sand supply. Sand placement in the nearshore zone is shown in Figure 2-11 and would consist of pipe placement extending from the lagoon mouth along the ocean floor to the proposed placement location. Material excavated from the lagoon would be directly discharged through that pipeline into the nearshore, and the ebb bar/placement location constructed from the ocean floor up. Alternatively, sand would be pumped from the lagoon through a discharge line to a barge over the discharge site with a downspout, then directed downward into the ebb bar/placement location. Material would exit the barge-mounted downspout near the seabed and settle on the seafloor within the placement location. The barge would be repositioned periodically to spread the discharge evenly, and natural forces would complete the distribution. No beach closure or shore-based activities would occur.

Beach Building

A number of projects have placed sand directly on regional beaches. In fall 2012, SANDAG's RBSP placed sand on eight beaches along the San Diego shoreline from Oceanside to Imperial Beach, including a number of beaches in proximity to San Elijo Lagoon. In 2001, an initial RBSP placed sand on these beaches plus others (total of 12). The sand placement footprints and beach building strategies proposed for the lagoon restoration project would be similar to those utilized for RBSP. Maximum potential beach fill quantities for each beach location are presented in Table 2-20. Generally, beaches would be formed by transporting sand to the monobuoy off Cardiff, loading a barge, and using that barge to convey the material to a specific placement site. Once at the placement or receiver beach, the barge would connect to another temporary monobuoy. Material would be transported back to the placement beach via a discharge pipeline. The Cardiff placement site is close enough to the lagoon source that the material would be conveyed by pipeline only. Booster pumps may be necessary along the pipeline to ensure the material moves quickly enough to avoid settling and clogging of the pipe.

Sand would be discharged through the discharge pipeline to the beach placement site mixed with a high proportion of water as a slurry. Discharged sand would be initially pumped into a training dike constructed to reduce turbidity and aid in the retention of pumped sand (PDF-41). As slurry is discharged from the pipeline, the dike directs the flow of the discharge and slows the velocity of the slurry, thereby allowing more sediment to settle onto the beach instead of remaining in suspension and being transported into the surf zone. Once discharged onto the beach, sand would be allowed to settle from the water/slurry. The sand would then be graded and spread along the beach using bulldozers to create a larger beach footprint of specific dimensions (elevation, width, and slope). Generally, beaches would be constructed to elevations up to +12 feet above MLLW. The post-construction upper slope would be steeper than the pre-construction profile, but would quickly and naturally evolve toward an equilibrium average nearshore slope, which is a function of sediment grain size and wave characteristics. The beach fill would naturally disperse over a wider portion of the beach and nearshore zone, resulting in a flatter profile. Flattening of the slope and adjustment of the beach profile causes reduction of the berm width from the post-construction profile. As the beach is augmented in one segment, the pipeline is extended to a new portion of the beach, where the same sequence of activities occurs.

Beach placement footprints for this project would be the same as those identified for RBSP at Leucadia, Moonlight, Solana Beach, and Torrey Pines.[2] The Cardiff placement site for this project would extend farther north and south of the previous footprint used for RBSP.

On-Site Fill Use

Some excavated material would be used on-site as fill to create the transition areas and underlying the nesting area. This material would be piped or barged through the lagoon and would be placed during construction.

Offshore Transport to LA-5

Under Alternative 1A, dredged material would not qualify for beneficial reuse (e.g., would be excessively silty or fine-grained). Instead it would be transported to LA-5. This location is one of 12 offshore disposal sites designated by EPA and is located approximately 28 miles southwest of San Elijo Lagoon. This is the closest of the 12 disposal sites to the project. Once material is removed through dredging, it would be transported to a monobuoy temporarily located off the

[2] The Torrey Pines site was used as part of 2001 RBSP. As part of 2012 RBSP, the site was evaluated for environmental impacts but not used due to financial reasons.

lagoon inlet, then via barge to LA-5. Preliminary coordination with the Corps and EPA indicates the material appears suitable for disposal at LA-5. If Alternative 1A is selected for implementation, additional testing (Tier 3) and authorization for disposal will be required from the Corps and EPA. Should the materials be determined to be not suitable for disposal at this location, the material would be sequestered on-site in built transition or nesting areas.

2.10.15 PUBLIC SAFETY/ BEACH, OCEAN, AND LAGOON CLOSURES

Due to construction activities, limited areas may be temporarily closed to access for public safety reasons. This could include portions of trails within the Reserve. Alternative trail access would remain available throughout construction, however, to maintain public access to the Reserve. Staging and stockpile areas outside of the secured lagoon site, such as beach staging areas, could also be fenced for public safety, as required. These sites could include areas designated for pipe and equipment stockpiling, or maintenance (e.g., washdown or fueling) areas. Such areas may be located around the perimeter of the lagoon or on the beach.

Specific areas of the lagoon, materials placement, and staging/access areas may require temporary lighting to maintain public safety as well. Lighting would be provided during nighttime construction activities such as dredging, placement of dredged materials, and nighttime deliveries. There may also be focused areas requiring lighting to maintain security, such as staging areas outside the larger lagoon site. Night lighting would be limited to those areas required for safety, directed downward, and shielded to minimize light spillover into adjacent areas of sensitive habitat and/or residential development.

For beach placement sites, portions of the beach directly affected by active replenishment and construction activities may be closed temporarily. Adjacent stretches of beach not directly affected by placement activities, such as those areas through which pipeline may extend but where sand is not directly being placed, would remain open to public access and recreational activities. Depending on the beach site and material excavation rates, up to 500 feet of beach may be closed per day in a specific location. As sand placement activities shift along the beach, those areas in which sand placement has been completed would be reopened to public use. Horizontal access along the back beach would be maintained, with temporary closures occurring as necessary to complete sand placement to the back edge of the beach, particularly where no alternative horizontal access exists (e.g., where a wet beach abuts bluffs). Ocean areas directly adjacent to sand transport/placement equipment and activities may also be temporarily closed to ensure public safety. Buffers around temporary monobuoys and ocean placement sites would be maintained to avoid water recreation users and vehicle safety hazards. Each of these measures is described in Table 2-25.

As part of sand placement on the beach, the SELC would be in consistent communication with local jurisdictions and safety agencies (e.g., lifeguards) to ensure notification and safety measures are implemented. Additionally, notifications in the local media would be placed to help ensure public awareness of the project and potential construction activities. Additional safety measures are described in Table 2-25.

2.10.16 PROJECT DESIGN FEATURES

The SELRP is a restoration project designed to enhance the lagoon system as a whole. Due to the nature of the project, an effort has been made to proactively incorporate measures into each of the alternatives to minimize and avoid, where possible, impacts to resources. These "project design features" represent a commitment by the SELC to construct the project in an environmentally sensitive way. Some project design features are incorporated to avoid or minimize a potential significant impact proactively through design, but others are additional measures that support the overall restoration objectives of the project without being tied to a specific potential impact. Many features also represent regulatory or code requirements that the project would need to comply with in order to be approved by various agencies and/or implemented legally. These features are committed to by the project applicant and would be implemented by the contractor or other parties before, during, and after construction. Inclusion of these project design features is considered in the determination of CEQA impact significance in Chapter 3. These features are summarized in Table 2-25 and include the purpose, timing, and responsibility for implementation of each project design feature.

Table 2-25
Summary of Project Design Features/Monitoring Commitments and Minimization Measures

Project Design Feature ID	Design Features	Purpose	Timing	Implementation Responsibility
	General			
PDF-1	Implement a public information program to assist nearby residents in understanding the purpose of the project and disseminate pertinent project information.	Reduce impacts related to land use incompatibilities.	Prior to and during construction	SELC
PDF-2	Maintain project website with current construction schedule.	Ensure timely public notification; minimize land use conflicts.	During construction	SELC
PDF-3	Conduct fueling and/or maintenance activities at designated staging areas and designated fueling areas, and prepare a Spill Prevention, Control, and Countermeasure plan for hazardous spill containment.	Minimize safety hazards associated with release of hazardous materials.	During construction	Contractor
PDF-4	Stake construction areas and no construction zones. Limit construction equipment and vehicles to within these limits of disturbance.	Protect sensitive habitat areas; reduce public safety hazards.	During construction	Contractor
PDF-5	Restrict access to portions of lagoon trails and beaches to maintain public safety.	Reduce risks to public health and safety.	During construction	Contractor
PDF-6	Maintain alternative access to beaches adjacent to placement sites, portions of trails not under active construction, and the Nature Center.	Minimize impact on public access.	During construction	Contractor
PDF-7	Shield and direct night lighting toward nonsensitive lagoon areas or the ocean and away from residences and habitat.	Minimize effects on residents and sensitive species.	During construction	Contractor
PDF-8	All construction equipment, fixed or mobile, would be equipped with properly operating and maintained mufflers.	Minimize noise impacts.	During construction	Contractor
PDF-9	House exposed engines on dredging equipment to the greatest extent possible.	Minimize noise impacts.	During construction	Contractor
PDF-10	Contractors shall maintain equipment and vehicle engines in good condition and properly tuned per manufacturers' specifications. Idling time for construction equipment will be minimized, as appropriate	Minimize air quality impacts and greenhouse gas (GHG) emissions.	During construction	Contractor
PDF-11	All storage, handling, transport, emission, and disposal of hazardous materials shall be in full compliance with local, state, and federal regulations (Health and Safety Code, Division 20, Chapter 6.95, Article 2, Section 25500-25520)	Avoid impacts associated with hazardous materials.	During construction	Contractor

Project Design Feature ID	Design Features	Purpose	Timing	Implementation Responsibility
	Lagoon Restoration			
PDF-12	Utilize continuous construction, with internal phases to (1) restrict vegetation clearing and grubbing to outside the breeding season (February 15–September 15) (2) limit active construction to two basins at a time (excludes construction of Coast Highway 101).	Minimize impacts to sensitive wildlife species and their habitats.	During construction	Contractor
PDF-13	Have Biological Monitor on-site during construction; frequency may vary depending upon activity but could be daily during breeding season or every other week at other time periods. While clearing and grubbing activities are occurring, walk along the impacted habitat ahead of machinery in an effort to flush the birds and other wildlife. Also, while monitoring, remove sources of impounded water resulting from construction equipment (if any) and confirm compliance with construction specifications regarding no ponding. Ensure no encroachment into sensitive "no construction" zones.	Confirm implementation of biological permit conditions, design features, mitigation measures, and applicable construction specifications.	During construction	Qualified biologist
PDF-14	Prior to initiating construction, identify sensitive "no construction zones" and fence or flag those areas	Minimize impacts to sensitive habitat areas.	Prior to construction	Qualified biologist/Contract
PDF-15	Use wet construction methods to the extent possible.	Minimize impacts to water quality (minimize temporary grading and roads, and exposure of graded soils) and sensitive species and habitats.	During construction	Contractor
PDF-16	Initiate flooding of habitat areas outside of the breeding season. If flooding is reduced and required again within the same year, reinitiation of flooding will occur outside the breeding season as well.	Minimize impacts to breeding bird nests and nesting activity.	During construction	Contractor
PDF-17	Clear and grub activities will occur in sensitive habitats in flooded areas. If clear and grub is required in dry conditions, a qualified biological monitor will walk ahead of the impact area to flush birds and other wildlife if conditions are appropriate and safe.	Minimize impacts to resident bird species and sensitive wildlife species.	During construction	Contractor/Qualif ied biologist
PDF-18	Controlled inundation will be used prior to clearing and grubbing in low- and mid-marsh habitat to actively encourage wildlife to relocate from vegetation to be cleared to adjacent nonimpacted habitat. After at least 24 hours of consistent inundation, grubbing of vegetation within the grading footprint will occur while still inundated to minimize the likelihood of contacting marsh birds.	Minimize impacts to resident marsh bird species.	During construction	Contractor

Project Design Feature ID	Design Features	Purpose	Timing	Implementation Responsibility
PDF-19	Site staging areas and access roads at existing access points and previously disturbed areas, where feasible	Minimize impacts to intact habitat and reduce site preparation requirements.	Final design	Engineer
PDF-20	Implement a targeted habitat enhancement plan for light-footed clapper rail and Belding's savannah sparrow. Enhancement activities may include fencing, public signage, selective vegetation removal (i.e., invasive species or native species not preferred by Belding's savannah sparrow), nesting platforms, perch removal, predator trapping/control, and other techniques deemed effective.	Provide refugia and promote nesting by light-footed clapper rail and Belding's savannah sparrow during construction in areas not directly impacted by construction activities.	During construction, prior to impacting suitable habitat areas	Qualified biologist
PDF-21	Prepare a Storm Water Pollution Prevention Plan (SWPPP) and implement best management practices. Prepare a Storm Water Management Plan (SWMP), a Hydromodification Management Plan (HMP), and Low Impact Development (LID) best management practices in compliance with the County MS4 Permit. The SWPPP and SWMP must be approved by the County and City of Encinitas as appropriate prior to approval of associated grading plans to confirm that the limits of disturbance would be maintained within the identified footprint.	Prevent pollutant discharge.	During construction and future maintenance activities	Prepared by QSD certified Contractor; Implemented by a QSP certified Contractor on site
PDF-22	Actively manage water levels by using a cutterhead dredge and/or temporarily closing the lagoon inlet. Cap overdredge pit with sand material to encapsulate material and prevent it from being introduced into the water column or released into the environment.	Minimize release of disturbed sediment to the coast. Minimize sedimentation, turbidity, and potential release of contaminants.	During construction	Contractor
PDF-23	Coordinate with the utility service provider for relocating and/or avoiding utilities infrastructure.	Reduce and/or avoid impacts to existing utilities infrastructure.	Prior to construction	SELC and Contractor
PDF-24	Coordinate with affected utility service provider in the event relocation is required.	Minimize utility service disruptions.	During construction	Contractor
PDF-25	Near Solana Beach sewer pipe or other utilities to be left in place, require dredging and excavation activities to stay above the minimum cover required by the utilities' owner.	Avoid impacts to existing utilities infrastructure.	During construction	Contractor
PDF-26	Equipment fueling and maintenance would occur at the designated staging areas and designated fueling areas away from publicly accessible areas.	Ensure public safety.	During construction	Contractor

Project Design Feature ID	Design Features	Purpose	Timing	Implementation Responsibility
PDF-27	During off working hours, secure heavy equipment and vehicles in staging area.	Ensure public safety.	During construction	Contractor
PDF-28	Provide fire suppression equipment on board equipment and at the worksite.	Reduce fire hazard risks.	During construction	Contractor
PDF-29	Require heavy equipment operators to be trained in appropriate responses to accidental fires.	Reduce fire hazard risks.	During construction	Contractor
PDF-30	Design recommendations from the San Diego Association of Governments (SANDAG) Sea Level Rise Study (SANDAG 2013) will be incorporated into pile foundation and abutment protection engineering for bridgework.	Ensure structural integrity of proposed structures.	Prior to construction	Engineer
PDF-31	The new bridges at the railroad and at Coast Highway 101 under Alternative 2B would possess deep pile foundations and well-protected abutments as engineered per appropriate regulatory safety requirements. Structures will be designed in accordance with applicable local and state engineering and design standards. Channel bank and bridge abutment protection will be installed along the inlet channel and at bridge crossings (Coast Highway 101, NCTD railroad, and I-5) to protect channels and structures from erosion during severe storm flow events. Rock armoring will be placed directly along the toe of bridge abutments and will “wrap” around the end of the earthen berms supporting each bridge. Monitor shoal development semi-annually and remove during regular maintenance or as-needed.	Ensure structural integrity of proposed structures. Minimize erosion and undermining of channels and structures. Maintain tidal exchange.	Prior to and during construction During and Post-construction	Engineer and Contractor SELC
PDF-32	The Coast Highway 101 alignment and bridge approach will conform to California Department of Transportation (Caltrans) standards for sight distance and vertical clearance.	Ensure public safety.	Prior to construction	Engineer
PDF-33	Temporary speed limit reduction for the traffic detour approaches and exits will conform to safe highway design speeds.	Ensure public safety.	Prior to construction	Contractor
PDF-34	Maintain two-way circulation on public roadways and access to neighboring commercial establishments during project construction. Restore roadway capacity upon completion of the new Coast Highway 101 bridge.	Minimize traffic conflicts and access issues.	Post-construction	Contractor
PDF-35	Create a temporary pedestrian walkway/bicycle path on the west side of open lanes of Coast Highway 101 to allow beach users to continue to access the beach to the north and south.	Minimize land use conflicts and access issues.	During construction	Contractor
PDF-36	All temporary facilities used for contractor activities shall be returned to either original or enhanced conditions upon completion of the project to the greatest extent possible, if not needed for future maintenance activities.	Minimize land use conflicts and access issues.	Post-construction	Contractor
PDF-37	Restore North Rios, Solana Hills, and Santa Inez trails and access to them to pre-project conditions after completion of construction use.	Minimize recreational conflicts and access issues.	Post-construction	Contractor

Project Design Feature ID	Design Features	Purpose	Timing	Implementation Responsibility
PDF-38	Design cobble blocking features (CBFs) to maximize burial and minimize exposed surface; treat with faux finishes to provide a more “naturalized” appearance.	Minimize contrast of new inlet and CBFs with existing beach environment.	Final design	Engineer
PDF-39	Complete Letter of Map Revision (LOMR) to formally modify the Flood Insurance Rate Map (FIRM) and/or Flood Boundary and Floodway map (FBFM), as required by City of Encinitas and FEMA.	Document revised floodway/floodplain boundaries	Post-construction	Engineer and Contractor
PDF-40	Channels and infrastructure improvements (Coast Highway 101/inlet, railroad trestle, or I-5 bridge) shall be reviewed by the County, Caltrans, City of Solana Beach, and City of Encinitas as appropriate prior to approval of associated grading plans.	Ensure structural integrity of proposed structures.	Prior to and during construction	Engineer and Contractor
	Materials Disposal/Reuse			
PDF-41	Construct longitudinal training dikes at sand placement sites.	Reduce nearshore turbidity.	During construction	Contractor
PDF-42	Release material at offshore stockpile and nearshore sites close to the ocean floor (e.g., directly from a subsurface pipe or via a vertical pipe extending from the barge downward toward the ocean floor).	Reduce drop height, settling time (and potential sand drift and loss), and surface turbidity at offshore (SO-5 and SO-6) and nearshore (off Cardiff) sites.	During construction	Contractor
PDF-43	Monitor water quality per RWQCB 401 Certification; if outside parameters then implement operational controls or halt materials placement, as necessary.	Verify permit compliance.	During construction as per RWQCB 401 Certification	Qualified biologist
PDF-44	Place material around storm drain outlets to allow continuation of proper drainage.	Continue proper drainage.	During construction	Contractor, in coordination with City Engineer
PDF-45	Conduct underwater survey of proposed anchoring, monobuoy, and routes of sinker discharge pipeline to verify absence of sensitive hard-bottom habitat; if found, relocate to avoid impacts.	Avoid direct impacts to sensitive hard-bottom habitats.	Prior to construction	Qualified biologist

Project Design Feature ID	Design Features	Purpose	Timing	Implementation Responsibility
PDF-46	Design offshore and nearshore placement sites to avoid artificial reefs, kelp, and other hard-bottom features to the satisfaction of the Corps. Provide a minimum 500-foot buffer zone from kelp beds and potential kelp habitat.	Avoid direct impacts to kelp and sensitive hard bottom habitats.	Final engineering and during materials placement	Engineering contractor and construction contractor
PDF-47	Assess habitat suitability for grunion spawning prior to construction, if construction would occur during the spawning season. Monitor for grunion spawning in construction area if suitable habitat present. If spawning observed, implement protective measures, as appropriate, or relocate/reschedule materials placement.	Minimize impacts to grunion.	March through August and per CDFW annual pamphlet *Expected Grunion Runs* (CDFG 2010a)	Qualified biologist
PDF-48	A Marine Mammal and Turtle Contingency Plan would be prepared prior to construction approved by National Marine Fisheries Service. A pre-construction contractor training would be conducted by a qualified biologist to educate workers with respect to protected marine species and avoidance measures required by the contingency plan. Monitoring during construction would include marine mammal observers on project vessels who would notify the vessel operator if a protected marine species is in the vicinity.	Reduce interactions between vessels and protected marine species.	Prior to initiation of construction and during construction	Qualified biological
PDF-49	Coordinate barge operations with the U.S. Coast Guard (USCG).	Minimize restricted areas/durations to maximize fishing opportunities.	Prior to initiation of construction and during construction	Contractor
PDF-50	Clearly mark pipelines used during materials transport (including offshore stockpiling efforts), including both floating and submerged, as “navigational hazards.”	Warn recreational users of water-based activities to ensure safety and avoidance.	Before and during activities in the ocean	USCG (via construction contractor)
PDF-51	Issue Notice to Mariners and maintain 300-foot buffer around monobuoy.	Warn recreational users of water-based activities to ensure safety and avoidance.	Before and during activities in the ocean	USCG (via construction contractor)
PDF-52	Designate a 300-foot buffer around the lane designated for barges to use to reach disposal/reuse sites and track actual routes. Employ Global Positioning System (GPS) tracking on barges to track disposal activity.	Minimize gear loss and fishing conflicts.	During construction	Contractor

Project Design Feature ID	Design Features	Purpose	Timing	Implementation Responsibility
PDF-53	Restrict public access at sand placement sites, both on the beach and in the nearshore ocean adjacent to the pipeline and monobuoy	Public safety during construction.	During construction	Contractor, in coordination with local lifeguards
PDF-54	Temporarily relocate mobile lifeguard towers, if nececessary	Ensure public safety during construction.	During construction	Contractor, in coordination with local lifeguards
PDF-55	Place sand to avoid blocking line-of-sight at permanent lifeguard towers. All sight lines from the viewing platforms of the lifeguard towers would be maintained and there would be no interference with views for the lifeguards.	Ensure public safety during construction.	During construction	Contractor, in coordination with local lifeguards
PDF-56	Post signs advising the public of the presence of steep sand slopes (e.g., scarps) should they develop on beaches where sand is being placed.	Reduce risks to public health and safety.	During construction	SELC in coordination with Marine Safety departments in the cities of Encinitas, Solana Beach, and San Diego
PDF-57	Prior to opening areas of beach with placed materials, spread the material and check it for potential hazards (e.g., foreign objects in the sand)	Reduce risks to public health and safety.	During construction	Contractor
PDF-58	Coordinate the schedule at individual materials placement site to the extent possible to avoid major holidays and special events.	Minimize land use and recreation conflicts.	During construction	SELC
PDF-59	Dedicated parking lots will be identified for employee parking during peak beach attendance to minimize effects to public parking availability, as necessary. A shuttle would likely be necessary for some of the more distant lots.	Maintain public beach access.	During construction	Contractor
PDF-60	Maintain horizontal access along the back beach where adjacent vertical access is not available. Where horizontal access is limited, (e.g., where a wet beach directly abuts bluffs), vertical access would remain to allow public access on either side of the active sand placement area as long as public safety is not compromised.	Maintain public beach access.	During construction	Contractor
PDF-61	Cover discharge pipeline with sand at consistent intervals to facilitate access from the back beach to the water.	Maintain public beach access.	During construction	Contractor
PDF-62	Notify residents at least 1 week in advance of nighttime construction work within 100 feet of residences; Restrict construction work to no longer than 3 consecutive nights within 100 feet of a specific residence where sleep disturbance may occur.	Notify residents of nighttime noise.	During construction	Contractor

Project Design Feature ID	Design Features	Purpose	Timing	Implementation Responsibility
PDF-63	Conduct surf condition monitoring in areas with higher placement volumes than historic placement to verify the modeling results and document the anticipated lack of change in coastal conditions.	Ensure no adverse changes to coastal conditions.	Prior to, during, and following construction activities	SELC and Engineer
PDF-64	Conduct sand placement at the Torrey Pines placement site outside of the bird breeding season (April 1 through September 15, or after August 1 with confirmation of cessation of nesting). Conduct monitoring during sand placement to avoid impacts to foraging snowy plover. Should foraging plover be present, the monitor will direct sand placement away from the foraging plover to allow time for the bird(s) to leave the site. In addition, night lighting shall be shielded and directed away from the back beaches.	Minimize impacts to snowy plover at Torrey Pines placement site.	During materials placement at Torrey Pines.	Qualified biologist

2.11 MONITORING, MAINTENANCE, AND ADAPTIVE MANAGEMENT

Implementation of the SELRP would require a comprehensive monitoring program to ensure compliance with regulatory requirements, track project success, and identify adaptive management strategies for use in the future. While it would be premature to develop a detailed monitoring program prior to selection of the Agency Preferred Alternative and LEDPA, this section discusses the framework and approach anticipated for the monitoring program. The comprehensive monitoring program for the SELRP would have two primary components with two different goals:

1. Construction monitoring: to minimize and avoid impacts associated with construction
2. Restoration monitoring: to track restoration success and maintain the lagoon into the future

Both program components are described in general below. The final details would be determined upon selection of an alternative and identification of permit conditions with the resource agencies. Items such as exact monitoring locations and frequencies would depend on the alternative to be implemented and would be detailed as part of the permitting process.

2.11.1 CONSTRUCTION MONITORING PROGRAM

The construction monitoring program for the SELRP would be designed to minimize and avoid impacts to resources that could occur during construction of the project. The program would address potential impacts associated with both construction within the lagoon as well as materials disposal/placement. The SELRP is a restoration project and, as such, has been designed to be proactive in incorporating measures to reduce or avoid impacts to resources where possible. A number of *project design features* have been incorporated into the project to avoid or minimize impacts, as identified in Table 2-25. *Mitigation measures* have also been identified under specific resources to reduce potential significant impacts, as identified throughout Chapter 3. Additional measures could be identified as conditions associated with permits that would be issued by regulatory agencies prior to project initiation. Compliance with these *permit conditions* would also be integral to construction monitoring. The monitoring program for construction would be composed of these different measures.

In general, the anticipated construction monitoring program can be divided into three distinct phases:

1. pre-construction (initiated approximately 1 year prior to construction),
2. during construction (up to approximately 36 months), and
3. post-construction (proposed 5 years after construction is complete).

A summary of the known measures is shown in Table 2-26 by construction monitoring phase. Detailed measures are identified throughout this document, either in Table 2-25 or under specific resource discussions.

Table 2-26
Summary of Construction Monitoring Elements and Timing Requirements for SELRP

Monitoring Element	EA/EIR Analysis Section	Monitoring Phase		
		Pre-construction	During Construction	Post-construction
Beach Conditions	3.2	✓		✓
Water Quality (Turbidity)	3.4		✓	
Biological Site Constraints	3.6	✓	✓	
Nearshore Biological Resources	3.6	✓		✓
Threatened and Endangered Species	3.6	✓	✓	
Grunion	3.6	✓	✓	
Marine Mammal and Turtle	3.6	✓	✓	
Cultural Resources	3.7	✓	✓	

Construction monitoring during lagoon restoration would focus on ensuring compliance with project features and measures, particularly with respect to biological resources, water quality, and cultural resources. A monitoring program composed of project design features, mitigation measures, and additional permit conditions will be completed as final design progresses and permitting occurs.

Many of the proposed materials placement sites have been identified based on previously authorized projects to minimize potential effects to sensitive resources (2001 and 2012 RBSPs). Since those projects have not resulted in significant environmental impacts, long-term monitoring is not anticipated at those sites, although specific resource agency conditions will be identified as part of the permitting process. Sand volumes proposed for placement at other sites have been limited to amounts that would not be predicted to result in significant effects to resources, so long-term monitoring at those sites is not necessarily anticipated, but would be determined through discussions with the various regulatory and resource agencies. Because pre-construction monitoring is designed to minimize construction impacts rather than establish a baseline for post-construction monitoring, it is different from the lagoon restoration component, which is addressed under the lagoon restoration monitoring program discussion below.

2.11.2 Lagoon Restoration Monitoring Program

A comprehensive restoration construction plan would be prepared once the final alternative is selected. Regardless of the alternative, the restoration plan would include requirements for pre-construction local plant salvage and/or seed collection (particular focus would be given to existing rare and sensitive plants), planting plans, weed abatement, and remedial measures, as well as established annual success criteria.

Monitoring for the lagoon restoration component of the SELRP would be primarily focused on the lagoon itself and would include pre- and post-construction monitoring, as well as monitoring for longer-term maintenance and an adaptive management program that would begin following completion of the post-construction monitoring program. These types of monitoring can be distinguished into two different monitoring objectives:

- Pre-and post-construction monitoring would be designed to focus on establishing a pre-construction baseline for lagoon conditions and sensitive species, then monitoring and confirming project success criteria are met over the longer term (5–10 years). Post-construction monitoring can also be tied to adaptive management actions that will facilitate project success. While the main components of the pre- and post-construction monitoring program have been identified, a detailed program will be identified after the CEQA Agency Preferred Alternative and LEDPA have been selected, and during final engineering of the project. This program will also incorporate permitting conditions identified after the Final EIR/EIS has been certified/approved, but prior to the initiation of construction.
- Long-term monitoring would be an integral part of an adaptive management program established to guide maintenance strategies into the future. Development of the detailed adaptive management program would occur after selection of the CEQA Agency Preferred Alternative and LEDPA, and during the final engineering phase of the project, prior to the initiation of construction.

Pre-construction monitoring for the SELRP would focus on establishing a baseline for assessing the success of restoration efforts. Each of the pre-construction surveys conducted for the lagoon restoration itself would have a post-construction component as well. The potential effects of restoration on sensitive bird species is one of the most important aspects of the SELRP. Monitoring bird species would include species-specific surveys and monitoring of the avian assemblage as a whole within the lagoon. Types of surveys anticipated as part of the monitoring program are identified in Table 2-27, but this program may be altered or augmented based on permit and agency consultation through the permitting process:

Table 2-27
Anticipated Biological Survey Framework for Informing Restoration Success

Type of Survey	Purpose
Benthic Macroinvertebrates	Evaluate the health and functioning of the restored lagoon, due to importance in estuarine food webs. Benthic invertebrates can affect, and be affected by, physical processes, such as erosion, sedimentation, and nutrient cycling. Monitoring would include sampling of both epifauna and infauna.
Fish	Reflect suitability of subtidal habitat as Essential Fish Habitat. As fish are expected to colonize the newly created channels almost immediately, post-construction monitoring for fish in shallow subtidal and intertidal channels would begin immediately following construction.
Light-footed Clapper Rail	Clapper rail utilize many of the habitat types within the lagoon (low and brackish marsh for nesting, in addition to mid- and high-marsh and mudflat for foraging), and the project would affect each of these to different extents. Surveys for this species would inform continued habitat availability for clapper rail within the restored lagoon.
Belding's Savannah Sparrow	Belding's savannah sparrow currently inhabits all three lagoon basins. Post-construction surveys would be designed to provide information on resiliency and recovery of this species.
Secretive Marsh Bird Surveys	Post-construction surveys are anticipated to demonstrate use of newly constructed low-marsh habitat and well as resiliency and recovery of secretive marsh bird populations.
General Avian Use of the Restored Lagoon	Monitoring of use of the lagoon by water-dependent birds, including shorebirds, waterfowl, gulls, terns and others, is anticipated to be conducted monthly for a period of 5 years to assist in determining if the project has met its goals and objectives for improving habitats for bird species.
Habitat/Species Coverage	The development of planted areas, i.e., saltmarsh and transition habitats, as well as sensitive species being tracked, would be monitored post-construction for 5 years in order to document the success of the restoration project's planting plan and inform adaptive management actions.

Post-construction monitoring of the SELRP would be focused on the lagoon restoration component and designed to document achievement of project goals and objectives, including habitat improvements for plants and wildlife, success of revegetation efforts, and use of the site by sensitive species. This analysis would also be used to inform potential future adaptive management decisions and actions. Post-construction monitoring would document as-built conditions and provide comparison with pre-construction baseline conditions immediately after construction. Intensive short-term monitoring of restoration success is anticipated to continue annually for a minimum period of 5 years after construction. It is more likely the short-term monitoring period would be developed based on 10 years of ecological performance standards; however, if success is achieved prior to 10 years, the site can transition to the less intensive, less expensive, long-term monitoring and management phase that would adapt to ecological conditions in perpetuity.

General processes to be monitored are identified below and are intended to educate maintenance and adaptive management efforts in addition to documenting success of the project goals and objectives. Specific monitoring protocols would be developed as part of the permitting process in consultation with the resource and permitting agencies. A project monitoring plan would be developed as part of this consultation process to identify the monitoring methods, success criteria, and remediation required, if any, of the program to be implemented as part of the SELRP.

Monitoring the physical parameters of the lagoon following construction is designed to guide short- and long-term management activities such as inlet maintenance dredging or removal of sediment deposition. Monitoring would include developing protocols for the following lagoon surveys. Additional requirements may be identified as part of the permitting and final design process.

2.11.3 Maintenance and Adaptive Management

The restoration plan would include both the anticipated maintenance regime and an adaptive management plan. The maintenance plan would identify those areas of the lagoon that are anticipated to require periodic maintenance, such as inlet or subtidal basin maintenance and/or dredging, or less frequent channel maintenance in other areas of the lagoon. The adaptive management plan would identify remedial measures that may be implemented if success criteria put in place as part of the project or permit conditions are not met or if conditions change during long-term monitoring and need to be addressed. Some of these actions may include, but are not limited to, experimental planting of certain areas, additional dredging, replanting of saltmarsh and transitional habitats, and amendment of soils. Detailed plans would be developed as part of consultation with permitting and natural resource agencies during the permitting approval process; however, it is anticipated that the long-term management plan would be a living document and would be updated regularly, as necessary. General components associated with the adaptive management strategy are described below.

1. **Replacement Planting**. Planted material that fails to become established would be replaced with similar plant species. Replacement vegetation would be installed between October 1 and March 31, to the extent possible.
2. **Weed Abatement**. Weedy species would be removed from the restoration site frequently so they do not compete with the establishment of native plantings.
3. **Trash Removal.** Trash would be removed and disposed of in an acceptable manner, e.g., trash bins or landfill.
4. **Bank Protection Repair.** Should severe storms or other events result in damage to bridge and channel armor, repairs may be completed.

5. **Biological Monitoring and Maintenance of Habitat Quality.** Regular biological monitoring would be conducted to ensure that the wetlands meet biological goals. These activities would include:

   - habitat protection and posting of No Trespassing signs,
   - enforcement of regulations associated with the restoration of the wetlands and protection of listed species,
   - control of nonnative invasive plant species by mechanical and chemical means as appropriate, and
   - control of feral/exotic animal species using trapping and barriers as appropriate.

6. **Nesting Areas/Breeding.** A comprehensive program of inspection and maintenance of sensitive species breeding and nesting areas would be included as part of the biological monitoring program. Nesting area management would require both regular control of excessive, especially weedy vegetation, and of predators in the surrounding urban environment.

7. **Threatened and Endangered Species.** Species-specific monitoring and management objectives will be established in conjunction with the resource agencies for threatened and endangered resident species. Measures may include ongoing surveys, habitat improvements, predator control, or other activities for the benefit of the species.

8. **Inlet Maintenance.** In addition to potential closure of the inlet by sediment transported during an extreme storm event, the regular flood and ebb currents moving through the inlet would build a flood shoal in the interior of the inlet. These sediment deposits in the flood shoal can change the habitat distribution within the wetlands by reducing the tidal range and/or by raising the elevations. As part of the adaptive management program, criteria establishing thresholds for initiating inlet maintenance would be developed.

9. **Channel Maintenance.** While maintenance of the inlet itself is anticipated to occur as frequently as every year, depending on the alternative, vegetation encroachment or sediment accumulation could occur in portions of lagoon channels over time. Maintenance of focused areas within lagoon channels is anticipated approximately every 10 years but would be tied to specific thresholds for initiating maintenance activities, which could involve vegetation removal and hauling from the site, or sediment removal through dredging small areas of the lagoon.